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REPORT TO U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF WASTE PROGRAMS ENFORCEMENT

DRAFT PRELIMINARY REPORT
REMEDIAL INVESTIGATION PART 1

MONTROSE FACILITY SITE
(LOS ANGELES, CALIFORNIA)

MARCH 1986

METCALF & EDDY, INC.
1029 Corporation Way
Palo Alto, California 94303

The work upon which this publication is based was performed under subcontract to GCA/Technology Division, under contract to U.S. Environmental Protection Agency

EPA Work Assignment No. 84-299
GCA Work Assignment No. 84-299-002-14

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Metcalf & Eddy | Engineers

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INTRODUCTION

Metcalf & Eddy prepared this Remedial Investigation (RI) Part 1 preliminary report at the request of the U.S. Environmental Protection Agency (USEPA), to assess conditions at the Montrose hazardous waste site. This work was performed under subcontract to GCA/Technology Division, under USEPA Contract No. 68-01-6769, USEPA Work Assignment No. 84-299.

This report summarizes soil and groundwater sampling investigations that were performed in accordance with the RI/FS Final Work Plan (October 1984). Preliminary results obtained by other agencies and Montrose Chemical Corporation are also presented. Conclusions and recommendations made in this report will provide a basis for the Part 2 field program sampling strategy.

The main objectives of the Part 1 field program are to determine (1) the extent of soil contamination; (2) if contaminants from the Montrose site have moved down through the unsaturated soil zone to the groundwater system; and, if so (3) to ascertain the direction of groundwater flow, the existence and significance of perched groundwater, and to assess whether it merges with the underlying aquifers. Potential contaminant sources, pathways, and receptors are identified and discussed.

A list of chemicals targeted for further investigation in the next phase of work will be generated from this report. The criteria used to identify chemicals of concern include (1) chemicals found in site soil and water which may have originated from industrial practices carried out on the property,

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The scope of this report is to present and discuss results to date, to discuss chemical transport pathways, and to recommend additional investigation. Management alternatives and cleanup actions are not within the scope of this report and will be addressed later in the Feasibility Study.

This report presents new field data gathered during the Part 1 field program and reviews literature and other data gathered relevant to a hydrogeologic assessment of the site. Numerous local, state, and federal agencies were contacted to obtain data relevant to the hydrogeology and water quality of the Montrose site. Field work involved site reconnaissance and collection of samples from 17 soil borings, 12 groundwater samples, and 2 offsite background soil samples.

BACKGROUND

Site Description

The site used by Montrose Chemical Corporation from 1947 to 1982 covers 13 acres along Normandie Avenue in Los Angeles, California (Figure 1). Prior to the removal of buildings in 1982, the site consisted of a large central processing area that included the main DDT processing building, a surface impoundment (waste recycling pond), cooling tower, storage areas, special products plant, and maintenance shop (Figure 2). The main offices, laboratory, warehouses, special products plant, and locker rooms were situated to the east of the site. The special products plant is shown in Montrose facility plans [52]; however, it is

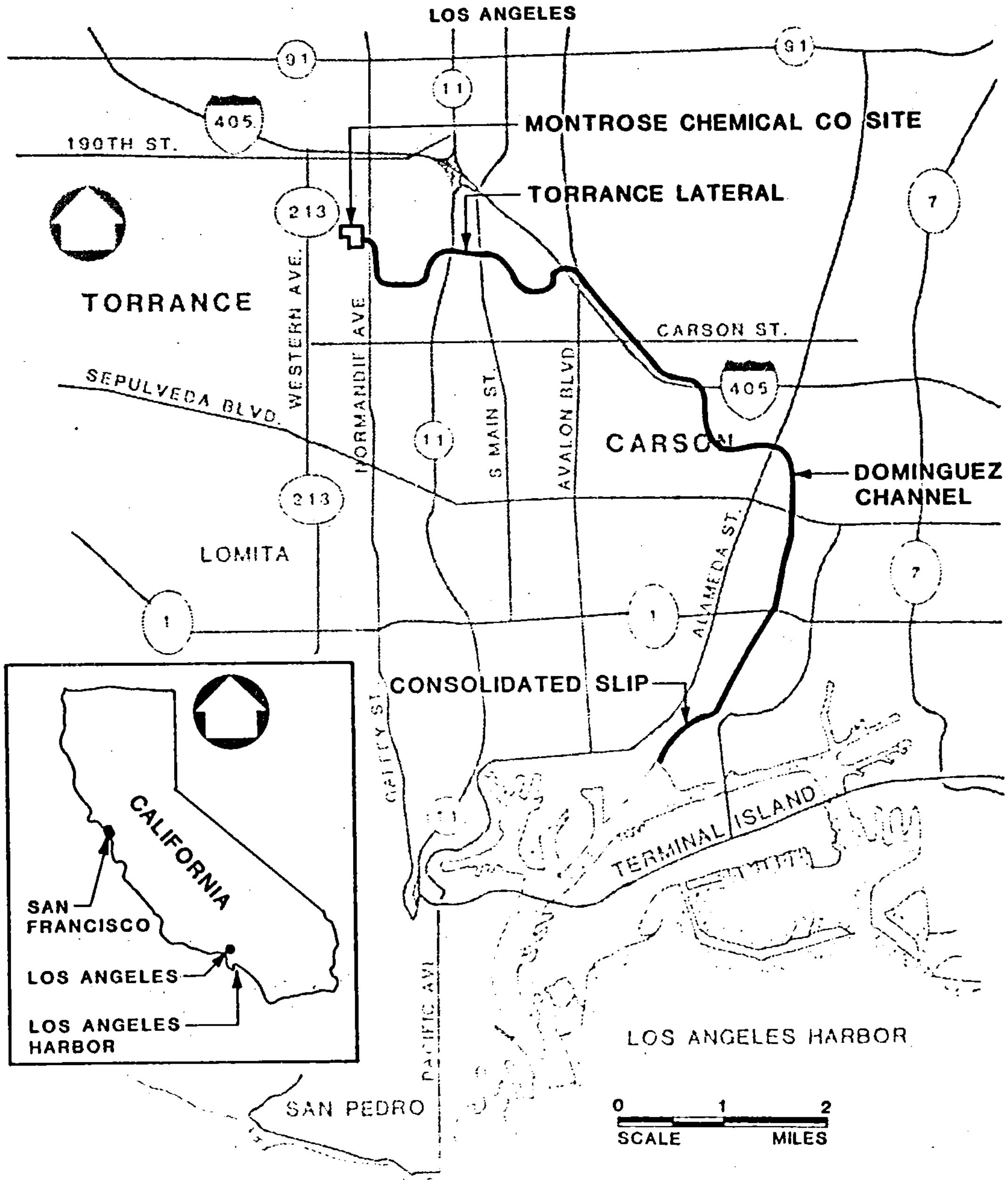
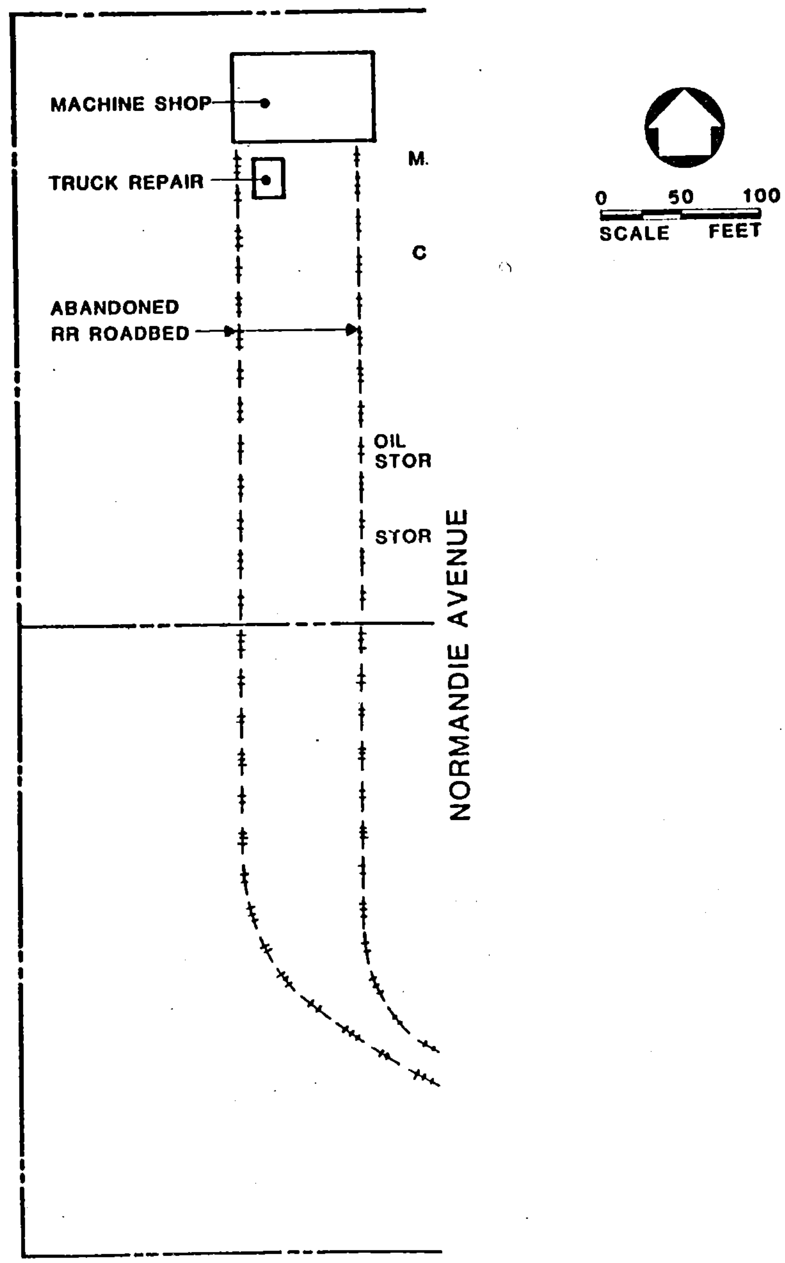


FIGURE 1. LOCATION MAP - MONTROSE FACILITY SITE



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1. J.S. DUGGIN, LOCKHEED, INC. PHOTOGRAPHIC
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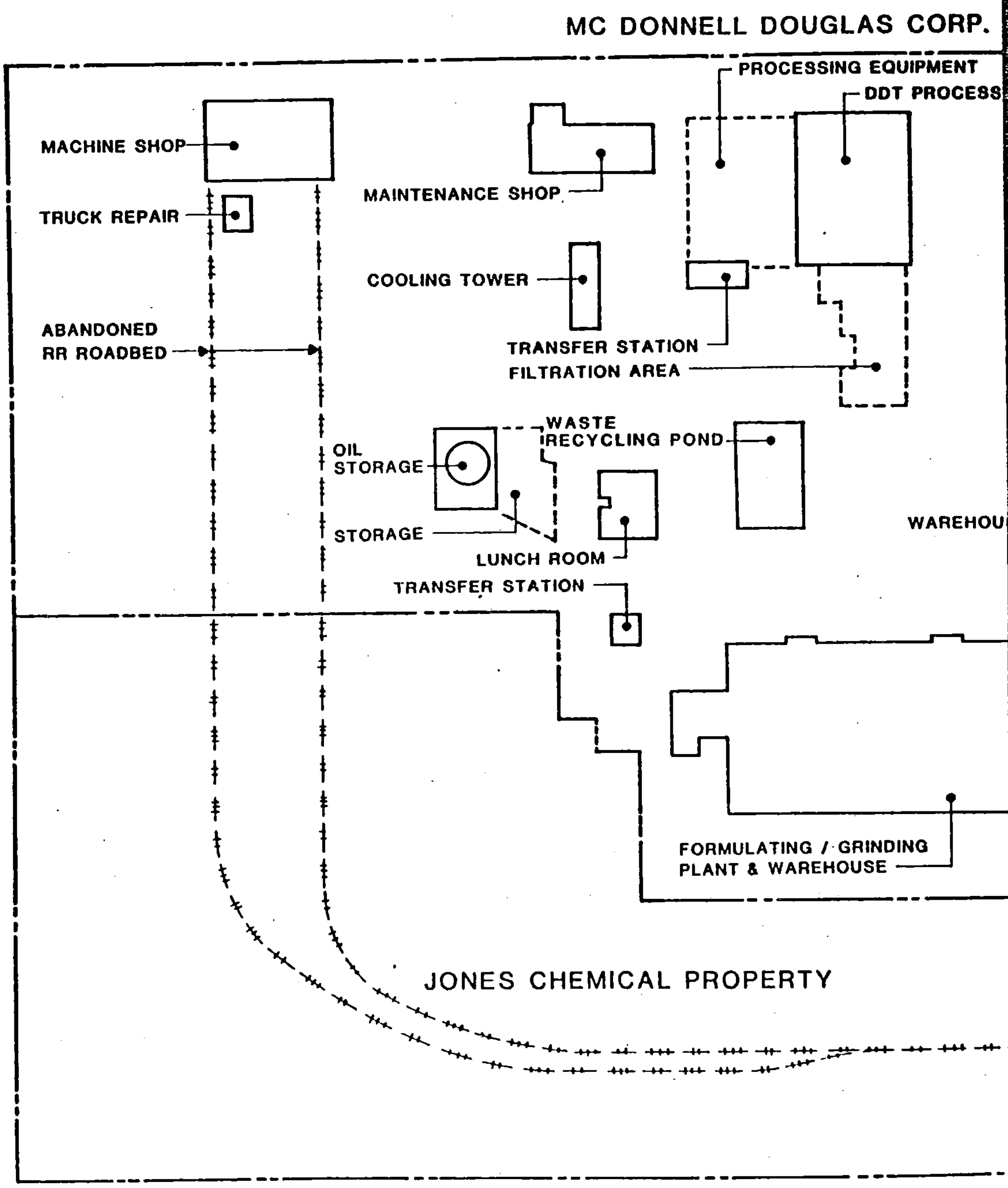
SEPTEMBER 1981.

2. MONTROSE CHEMICAL CORPORATION OIL SPILL P
COUNTER MEASURE PLAN (1-3-75).

FIGURE 2.
MONTROSE FACILITY PLAN



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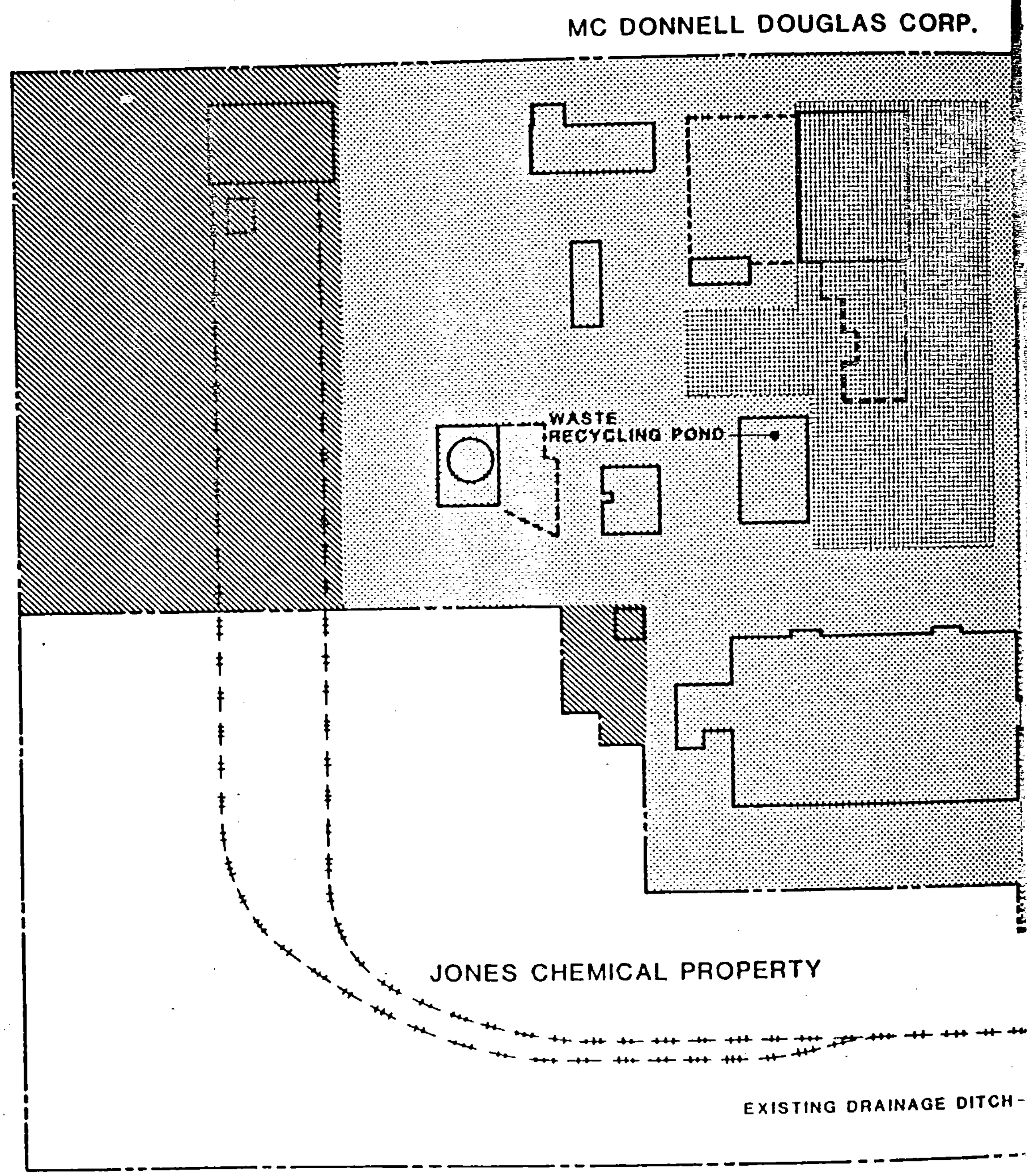
1. J.S. DUGGIN, LOCKHEED, INC. PHOTOGRAPHIC ANALYSIS OF FOUR CALIFORNIA HAZARDOUS WASTE SITES (1938-1981). U.S. EPA OFFICE OF RESEARCH AND DEVELOPMENT, MONITORING SYSTEMS LABORATORY. SEPTEMBER 1981.

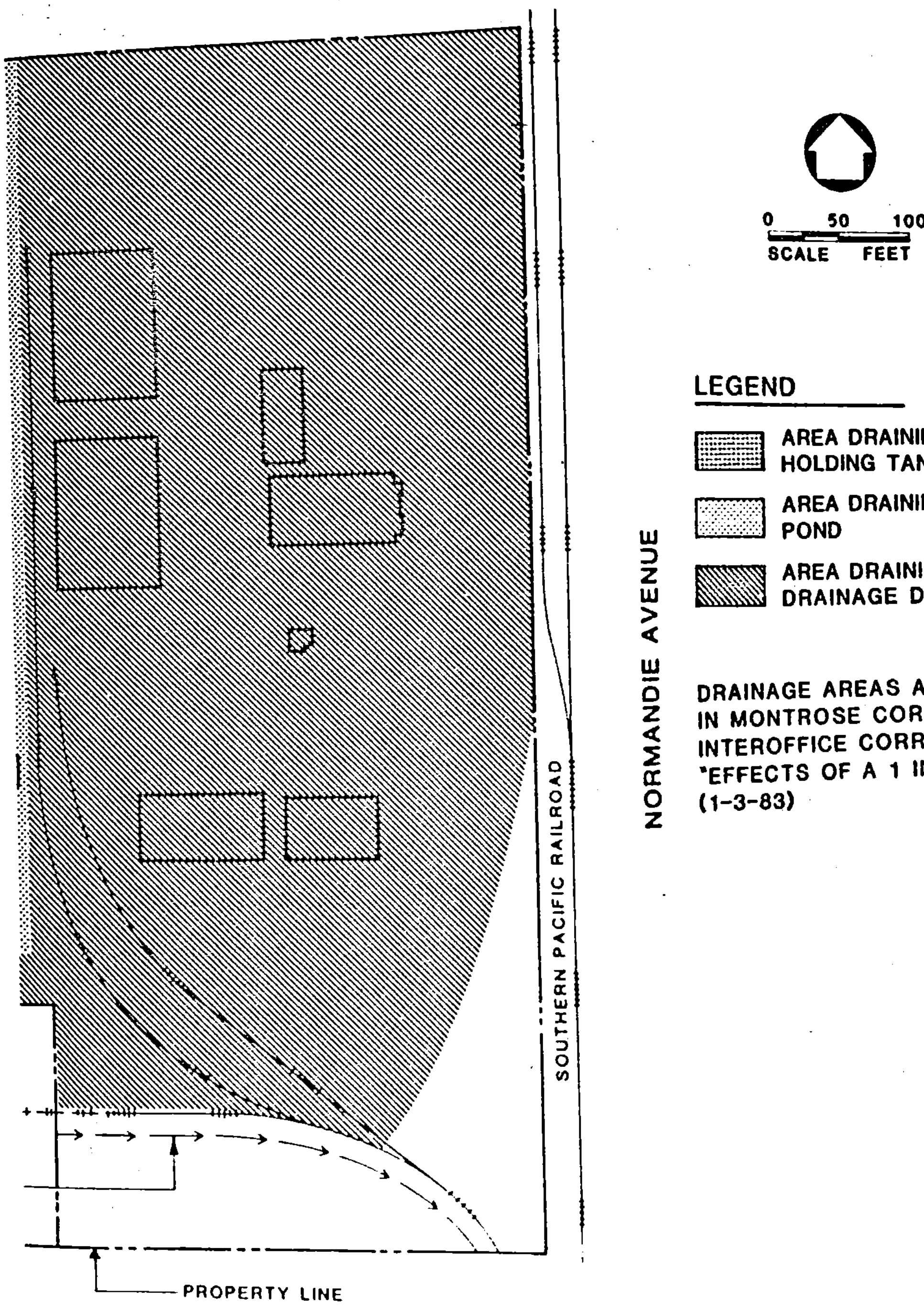
2. MONTROSE CHEMICAL CORPORATION OIL SPILL PREVENTION CONTROL AND COUNTER MEASURE PLAN (3-3-75).

not known what materials were manufactured there. The western portion of the site was historically used as a storage area and machine shop and truck repair facilities.

Aerial photographs available from 1938 through 1983 indicate various locations across the site used for storage of unknown materials (either product and/or waste). Two possible waste pits west of the oil storage facility were also identified from aerial photographs. Four railway tracks existed onsite, two of which were abandoned between 1965 and 1974. Primary handling of DDT onsite was at the processing facility, the formulation and grinding plant, warehouses, and various storage areas. Wastewater inspections by the Los Angeles County Sanitation District (LACSD) in the 1970s-1980s also indicated high concentrations of DDT emanating from the men's and women's locker rooms situated north and south of the main offices [1]. DDT concentrations in the sanitary sewer system at a location close to the site were attributed by LACSD to mop washwater and employees shaking dust from DDT-contaminated clothes in the locker rooms. However, this source of DDT is not part of the waste stream discharge generated directly by the process activities at the site. Waste stream discharge to the sanitary sewer ended in 1972; subsequently, process wastes were hauled offsite.

The main surface impoundment onsite was located south of the processing plant (Figure 2) and was referred to as the waste settling and recycling pond. The pond was reported to be at least 30-ft deep, with an area of approximately 2,370 square feet, with a 10-ft freeboard around the perimeter. The recycling pond received contaminated process waste materials that over-flowed from two underground waste storage tanks. Stormwater runoff from the process areas, and the formulating and grinding plant also flowed into this surface impoundment (see Figure 3) [53].


MC DONNELL DOUGLAS CORP.
WASTE
RECYCLING POND
JONES CHEMICAL PROPERTY
EXISTING DRAINAGE DITCH



LEGEND

AREA DRAINING TO WASTE HOLDING TANKS

AREA DRAINING TO RECYCLE POND

AREA DRAINING TO EXISTING DRAINAGE DITCH

DRAINAGE AREAS AS ILLUSTRATED IN MONTROSE CORPORATION INTEROFFICE CORRESPONDENCE "EFFECTS OF A 1 INCH RAINFALL" (1-3-83)

FIGURE 3
SITE SURFACE DRAINAGE
(PRIOR TO 1982)

Prior to 1970, the pond was unlined and its contents were not prevented from leaking through to the underlying native sediments consisting of sandy silt to silty sand. The pond was lined in 1970 and remained in use until the plant was closed in 1982. It is reported that closure of the pond included removal of sludge and crushing of the "concrete" pond lining which was subsequently placed in large crushed concrete piles onsite [57].

History and Site Activity

From 1947 to 1972, DDT was manufactured at the site until it was banned from sale in the United States due to its persistence and toxic effects on wildlife. Manufacturing for use in third world countries continued at the site until 1982 when the site was closed and the main facilities were dismantled. Table 1 lists the chemicals used during the manufacturing process. Technical grade DDT is defined by its chemical composition as shown in Table 2.

Table 1. RAW MATERIALS USED IN DDT MANUFACTURING PROCESS[a]

Ammonium and sodium lignin sulfonates (Orzan)
Amorphous silicon dioxide hydrated (Hi-Sil 233)
Calcium silicate synthetic (Micro-Cel E)
Calcium sulfate dihydrate (industrial ground gypsum)
Chloral (trichloroethanal)
Magnesium silicate hydrate (talc)
Monochlorobenzene (MCB)
Oleum - 65% (fuming sulfuric acid)
Sodium-N-methyl-N-oleoyl taurate (Igepon T-77)
Sulfonated lignin (Reax 45A)
Sodium hydroxide - 50% solution

a. Submitted to California Department of Health Services by Montrose Chemical Corporation, May 1981.

A USEPA investigation in 1982 found DDT in surface water runoff and sediments leaving the Montrose property. This resulted in issuance of simultaneous enforcement orders by USEPA and the California Regional Water Quality Control Board (CRWQCB) which required prevention of DDT discharge from the property, soil sampling, and remedial action.

Montrose retained a consultant to perform an initial site investigation as a result of the enforcement orders. The sample results were not obtained under approved USEPA sampling and quality assurance plans and are only discussed here for comparison since no other data prior to regrading of the site are available. From June to August 1983, a total of 31 soil borings were made, with 103 samples analyzed for DDT and its metabolites. Montrose's letter report [2] indicated high concentrations of DDT on the west side of the site and at the former wastewater recycling impoundment. The State of California criterion for DDT as a hazardous waste is 1.0 mg/kg (parts per million). Montrose data (1983) demonstrated a range in DDT concentrations from 0.028 to 95,000 mg/kg (or parts per million). The results showed that the upper 3 feet of onsite soils contained 300 to 400 tons of DDT. This amount of DDT was calculated using average concentrations of DDT per unit volume of contaminated soil. Average concentrations of >1000 mg/kg, >500 mg/kg, and >100 mg/kg were used for each 1-ft depth interval (total depth 3 ft).

Montrose subsequently built a berm during the summer of 1983 intended to prevent stormwater runoff from leaving the site, presented results of a soil sampling program, and submitted plans to install an asphalt cap over the entire site as part of their property redevelopment plan. USEPA reviewed the plans, received comments from state and local agencies and the public, and found the plans to be unacceptable. The potential hazard posed by this site enabled the USEPA to propose Montrose for inclusion on the National Priority List. Federal procedures required implementation of a Remedial Investigation/Feasibility Study (RI/FS) in order to select a comprehensive remedial action.

In April 1985, Montrose extensively graded and capped the site with asphalt in an effort to prevent surface runoff and vertical percolation. The site work probably redistributed concentrations of onsite chemicals including DDT. Regrading activities involved the upper 3 feet of site soils which were redistributed to increase the elevation of new building pad locations. This project was neither authorized nor endorsed by USEPA.

Five shallow groundwater monitoring wells were installed by Montrose during April 1985. The field program included drilling one deep soil boring (S-101) to a depth of 50 feet at the center of the former impoundment; the five wells were drilled to depth of 72 to 80 feet, and two rounds of groundwater samples were taken. This effort also was not conducted under approved USEPA sampling and quality assurance plans. As split samples were not taken by USEPA nor any other agency, the validity of these results cannot be verified and the results are used only as an indication of contaminant distributions.

The USEPA Remedial Investigation Part 1 field program commenced in June 1985 as the next step in the RI/FS process. Two rounds of groundwater samples were collected from the onsite wells installed by Montrose and nearby offsite wells. Soil samples from 17 locations onsite were taken based on a grid design proposed in the RI Final Work Plan (October 1984). Two additional control soil samples were taken from offsite locations to identify local background concentration values. The results of this Part 1 investigation are presented in this report.

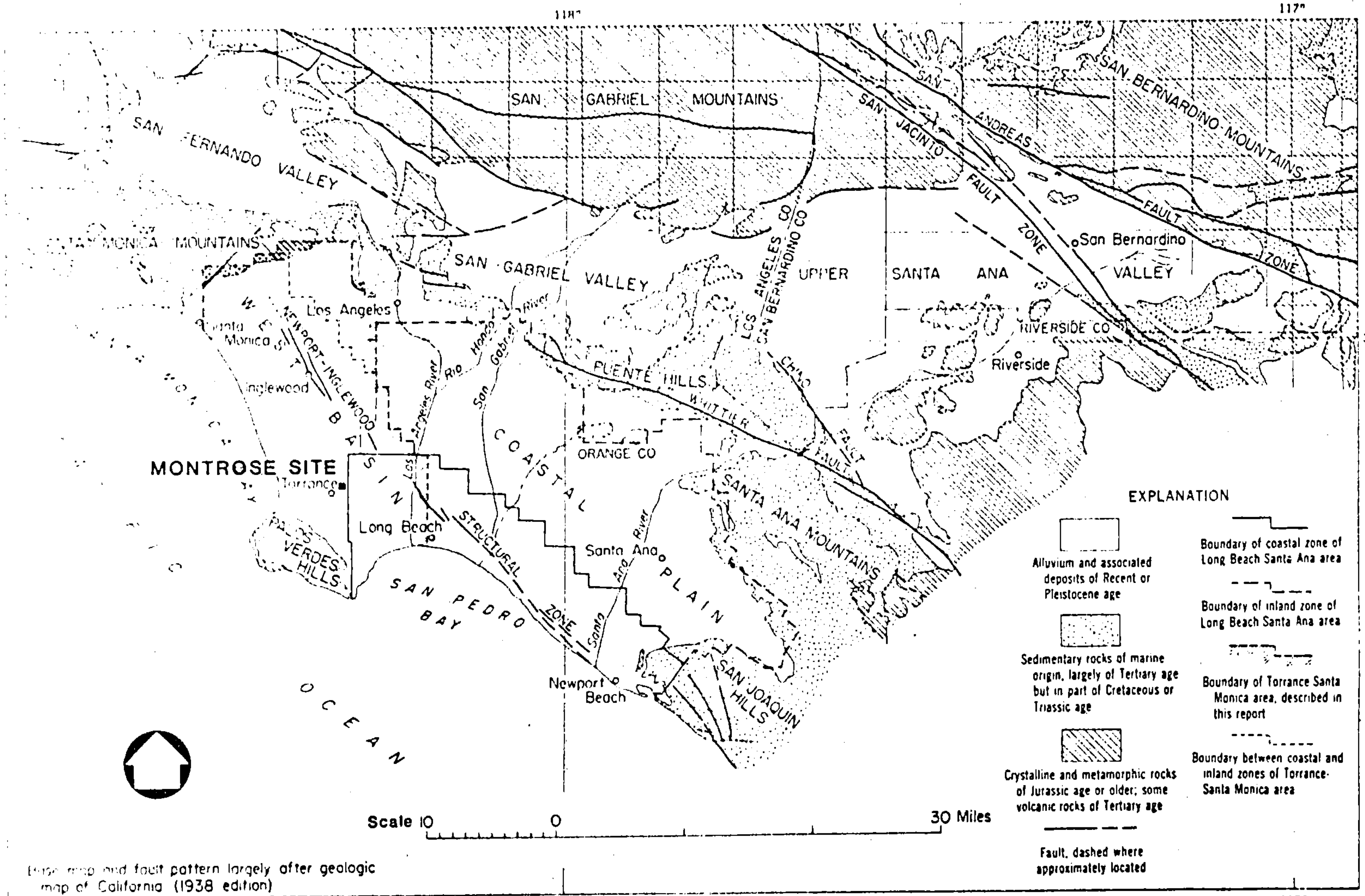
Modifications to the Final Work Plan (October 1984) were made during the Part 1 field investigation. A total of 17 soil boreholes were drilled instead of 18 shown in the work plan; this was because one borehole (24D) was instead extended an additional 10 feet to explore the proximity of the surface impoundment and high vapor concentrations detected during drilling. Groundwater measurements were taken on four occasions during a 6-week period; subsequent measurements have been the responsibility of Montrose Chemical Corporation.

STUDY AREA CHARACTERISTICS

Physiography

The Montrose site is located in a portion of the coastal plain of Los Angeles County known as the West Coast Basin. The West Coast Basin is bounded on the north by the Ballona Escarpment, on the south by San Pedro Bay, on the west by Santa Monica Bay, and on the east by the Newport-Inglewood uplift (Figure 4).

The Montrose site is situated within the Torrance Plain, a broad, flat floodplain deposited by low energy rivers and streams. These floodplain materials are approxiately 60-ft thick beneath Montrose. For reference, other physiographic provinces of the West Coast Basin which border the Torrance Plain are the Long Beach Plain, El Segundo Hills, Dominguez and Alamitos gaps, Baldwin Hills, Rosecrans Hills, Dominguez Hills, Signal Hill, and Palos Verdes Hills [7].



REFERENCE [12]

FIGURE 4. GENERALIZED GEOLOGIC MAP OF THE LOS ANGELES COASTAL PLAIN

Climate

The West Coast Basin receives a mild climate with an average annual precipitation of 12.1 inches (mean annual range: 3 to 29 inches). More than 90% of annual precipitation occurs between the months of November and April. Mean annual temperature is 63 °F, and average daily temperatures range from 55 to 70 °F. Average maximum summer temperatures are 75 °F; average minimum temperatures in winter are 53 °F. Wind directions are typically westerly to west-southwesterly with west-southwesterly to west-northwesterly winds prevailing during the months of July to December [54, 55]. Climatic effects are important in determining significance and rate of stormwater runoff as well as aerial distribution of wind-blown particles.

Regional Geology

The stratigraphy of the West Coast Basin consists of a basement complex of igneous and metamorphic rocks overlain by a sequence of marine sediment of Tertiary age and younger continental deposit of Quaternary age. A summary of the stratigraphy is presented in Table 3.

Quaternary strata are represented by semiconsolidated and unconsolidated alluvial deposits of Pleistocene and Holocene age; these include the major water-bearing formations. Pleistocene formations make up the majority of Quaternary stratigraphy and contain most of the aquifers presently tapped by wells.

The Pleistocene is generally divided into two formations: the older San Pedro Formation, which is composed of coarser materials, and the younger Lakewood Formation, which consists of relatively finer sediments. Each formation constitutes approximately half of the sediments deposited during the

Pleistocene. The San Pedro Formation consists mainly of sand and gravel associated with deposits of silt and clay. These sediments are up to 1,000-ft thick and were deposited under marine conditions. The Silverado Aquifer occurs within the sand and gravel units [6, 7].

Table 3. GENERALIZED STRATIGRAPHY [6, 7]

	Geologic age	Geologic formation [1, 2]	Approximate thickness, ft [1]	Lithologic description [1]	Aquifer system [2]
Quaternary	Recent	Active sand dune Alluvium Local unconformity	0-175	Unconsolidated sand, gravel, silt, and clay of lagoonal and fluvial origin	Bellflower Aquitard
Quaternary	Upper Pleistocene	(Terrace cover and Palos Verdes sand)	0-50	Nonmarine, red brown sand and silt, underlain by marine sand and gravel	Gage Aquifer
Quaternary	Upper Pleistocene	Lakewood Formation (Unnamed upper Pleistocene deposits) Local unconformity	0-400	Gravel, sand, silt, and clay of fluvial and marine origin	
Quaternary	Lower Pleistocene	San Pedro Formation Local unconformity	0-1,000	Unconsolidated to consolidated gravel, sand, silt, and clay (marine to fluvial origin)	Lynwood Aquifer Silverado Aquifer
Tertiary	Pliocene	Pico Formation	0-1,800	Semiconsolidated sand, silt, clay and fine gravel (marine origin)	Undifferentiated

[1] Poland et al. 1959.
[2] DWR Bulletin 104. 1961.

The Lakewood Formation is subdivided into the Unnamed Upper Pleistocene deposits which include silt, clay, sand, and gravel of fluvial and marine origin (up to 400-ft thick), and the upper Palos Verdes sand composed of sand, silt, and gravel units which are less than 30-ft thick and occur above the water table. In the Torrance Plain, this latter unit is capped by a terrace cover of non-fossiliferous red sand and silty sand up to 20-ft thick. The Lakewood Formation also contains a semiperched aquifer separated from the underlying Gage Aquifer by silts and clays within the same body which is collectively know as the Bellflower Aquitard.

Tertiary formations are principally composed of siltstone and shale with some sandstone and conglomerate units that contain brackish to saline water and are considered essentially non-water bearing. These sediments comprise the Monterey Shale and Puente Formations of Miocene age, and the Repetto and Pico formations of Pliocene age which together range in thickness from 5,000 to 14,000 feet. Tertiary formations underlie the Torrance Plain at great depth.

Regional Hydrogeology

Four aquifer units have been identified within the West Coast Basin; each has specific hydrologic characteristics. An aquifer is a water-bearing formation; an aquiclude is a nonwater bearing formation that restricts the movement of water between aquifers; and an aquitard is a poorly permeable formation through which groundwater can move at a slower rate than in an aquifer. The Bellflower Aquitard is the youngest and shallowest water-bearing unit in the area followed with increasing depth by the Gage Aquifer, Lynwood Aquifer, and Silverado Aquifer. The Lynwood and Silverado aquifers merge at locations within approximately 2 miles south of the Montrose site [6, 7, 12]. Groundwater movement within the Bellflower Aquitard is not well defined; however, vertical movement of groundwater is believed to occur between the Bellflower Aquitard and the Gage Aquifer [6, 7, 12]. Mergence is significant since the contaminated groundwater from one aquifer may be able to mix with groundwater in a previously uncontaminated aquifer.

Bellflower Aquitard. In early hydrologic reports, the Bellflower has been designated an aquiclude; however, subsequent well logs have indicated sandy horizons and water levels that demonstrate that vertical movement of water can occur. This report will refer to the Bellflower as an aquitard, which describes inhibited movement of groundwater rather than a confining barrier. The Bellflower Aquitard is also known as the Clay Cap or Upper Fine Grained Phase [6], the Upper Division of Alluvial Deposits of Recent Age [7], and the Manhattan Beach Aquiclude.

The Bellflower Aquitard overlies the Gage Aquifer. It extends throughout most of the Los Angeles Coastal Plain. Silts and clays of Recent to Late Pleistocene age comprise most of the aquitard with large pockets of sandy and gravelly clays indicated on driller's logs. The thickness of the Bellflower Aquitard ranges from 0 to 200 feet. There are few wells in this aquitard due to low yields and poor water quality. Well data have confirmed this aquifer to be semiperched since measured static water levels are higher than the pressure head of the underlying aquifer. A semiperched aquifer is defined as having greater pressure head than the underlying aquifer when there is no unsaturated (vadose) zone separating the two aquifers [6]. Recharge to this aquifer is principally from rainfall, and to a lesser extent by overflows from the Dominguez Channel. Contours plotted by the Los Angeles Flood Control District show a regional shallow groundwater gradient towards the southeast in fall 1984.

Gage Aquifer. The Gage Aquifer represents the lowest lithogic member of the Upper Pleistocene Lakewood Formation and was deposited under continental and marine conditions. This aquifer is also known as the 200-ft Sand [8] since it is found at that depth in many areas and is made up of fine-to-medium grained sands, gravel, silt, and clay.

Although considered an unimportant producing aquifer, there are reported to be over 200 wells located near the Town of Gardena [9], supplying information on the characteristics of the Gage aquifer. The Gage Aquifer attains a thickness of about 50 feet in the Torrance area, at elevations of between -100 to -150 feet (mean sea level). Transmissivity values of 20,000 gpd/ft and specific yields of 12 to 16% [9] have been recorded. The Gage merges with the overlying Gardena Aquifer approximately 1 mile northwest of the Montrose site [7], but does not merge with any underlying aquifers that occur immediately beneath the site, and is separated from them by thick units of sandy silt and clay. The Gage Aquifer merges with the underlying Lynwood and Silverado aquifers in areas near the Palos Verdes Hills. The regional hydraulic gradient is considered to be northwest toward the City of Hawthorne; however, beneath the site the local gradient appears to be toward the southwest [9].

Lynwood Aquifer. This aquifer represents the uppermost lithogic member of the San Pedro Formation. It is comprised of continental and marine deposits consisting of distinctive yellow-brown and red coarse gravel and sand, as well as silt and clay. The Lynwood is also known as the 400-ft Gravel [8]. Groundwater gradient in the Lynwood Aquifer is believed to be toward the southeast [7].

An important groundwater producing body, the Lynwood Aquifer has a known thickness of approximately 75 feet. The Lynwood Aquifer is shown on well logs at elevations of -225 to -300 feet (mean sea level). Transmissivity is reported to be on the order of 50,000 gpd/ft [9]. It is separated from the Gage aquifer by 75 feet of low permeability silts and clays that serve as a confining layer. These silts and clays, where they exist, prevent the mergence of groundwater between the two aquifers. The Lynwood Aquifer is also separated from the underlying Silverado Aquifer by approximately 175 feet of silts and clays; however, the two aquifers do merge seaward where the silt and clay layers are no longer laterally continuous.

Silverado Aquifer. The Silverado is considered to be the major groundwater body of the West Coast Basin and represents sediments of the Lower San Pedro Formation. The Silverado Aquifer provides the main water supply to this area; many large municipal and industrial wells withdraw from this source. Again, the deposits are of continental and marine origin and include fine-to-coarse grained blue-gray sands and gravels with discontinuous impermeable units.

This aquifer is found at an elevation of approximately -475 feet (mean sea level) and displays thickness of up to 275 feet [7]. Transmissivity of the aquifer is on the order of 125,000 gpd/ft [9]. The confinement of the Silverado Aquifer is apparent from deep aquifer maps [10] showing a piezometric head of -55 feet, mean sea level, which is equal to 420 feet above the top of the aquifer. Groundwater flow direction within the aquifer is reported to be east-northeast.

Water Quality. Major recharge to the West Coast Basin (WCB) occurs by subsurface flow across the Newport-Inglewood uplift,

Drainage

The Torrance area has a history of poor surface drainage due to the generally low permeability of clays and fine-grained soils that make up the floodplain. Previously, the surface runoff drained naturally toward the marshy area known as Dominguez Slough (previously named Nigger Slough). The slough underwent several periods of artificial drainage during the 1950s to 1970s as the area became more industrialized and the need for land grew. Eventually, this large slough area was channelized and modified so that by the 1970s, the Dominguez Channel existed as a clay-lined flood control and drainage channel which flows out to the Los Angeles Harbor in San Pedro Bay (Figure 1). The Torrance Lateral, a concrete-lined channel, was also constructed in the 1970s to help drain the Torrance Plain and connects to Dominguez Channel.

Drainage pathways both onsite and offsite are important since DDT is attracted to sediment particles, and particle suspension during storm runoff is considered the primary mode of DDT transport at the surface. Poor historical surface drainage may have caused ponding of some contaminants thus enhancing the potential for vertical transport of chemicals into subsurface horizons.

Several historical drainage paths onsite have been identified from aerial photographs [56]; these pathways have emanated from the storage area, main office buildings, railroad spurs, and parking lot (Figure 5). Water on the east side of the site flowed from these locations to the southeast corner of the property and into an open gunnite-lined ditch. Runoff from the ditch flows into a catchbasin located on Farmer Brothers' property (south of Jones Chemical) and continues through a 24-in. corrugated metal pipe that connects with a 42-in. underground

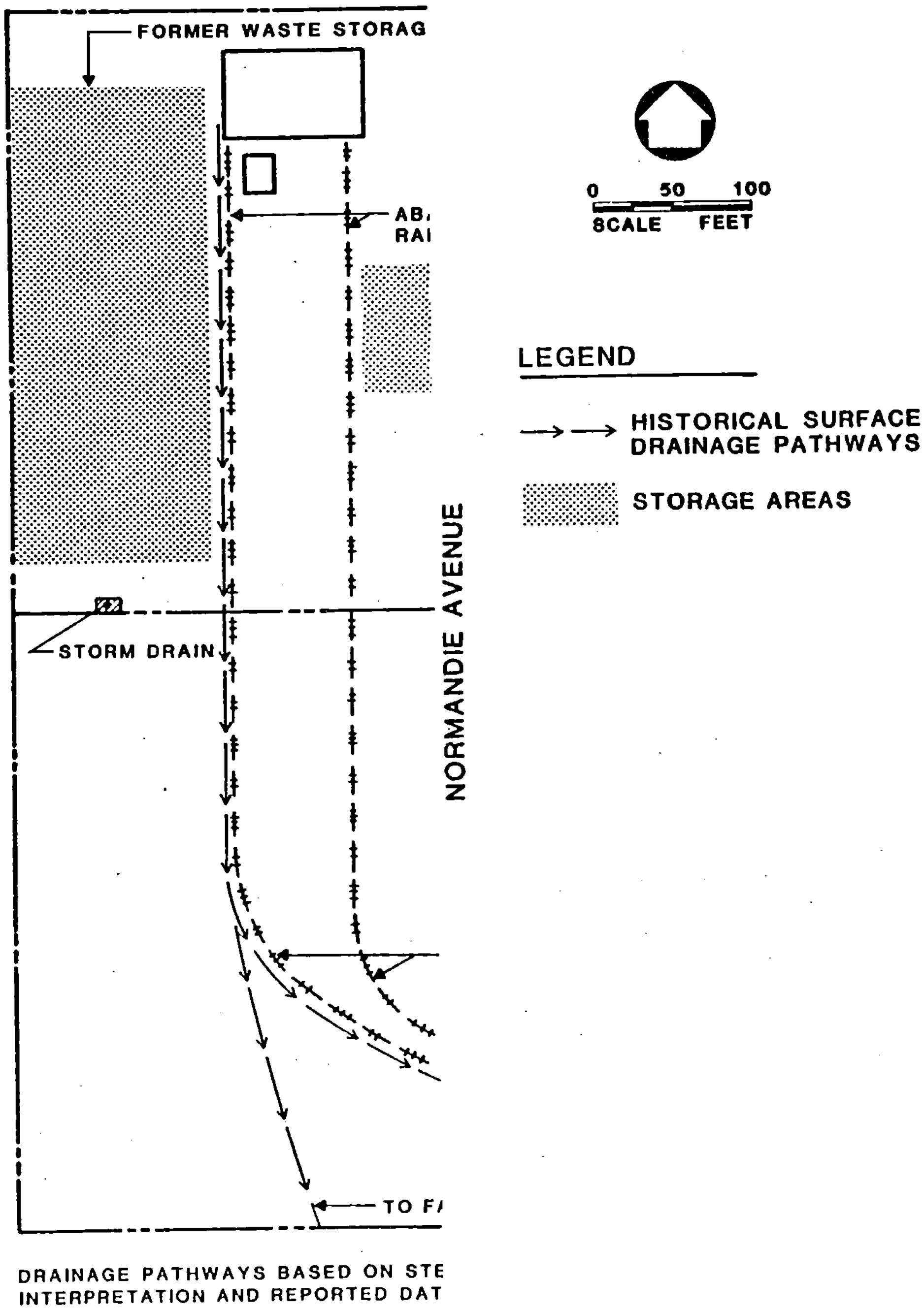
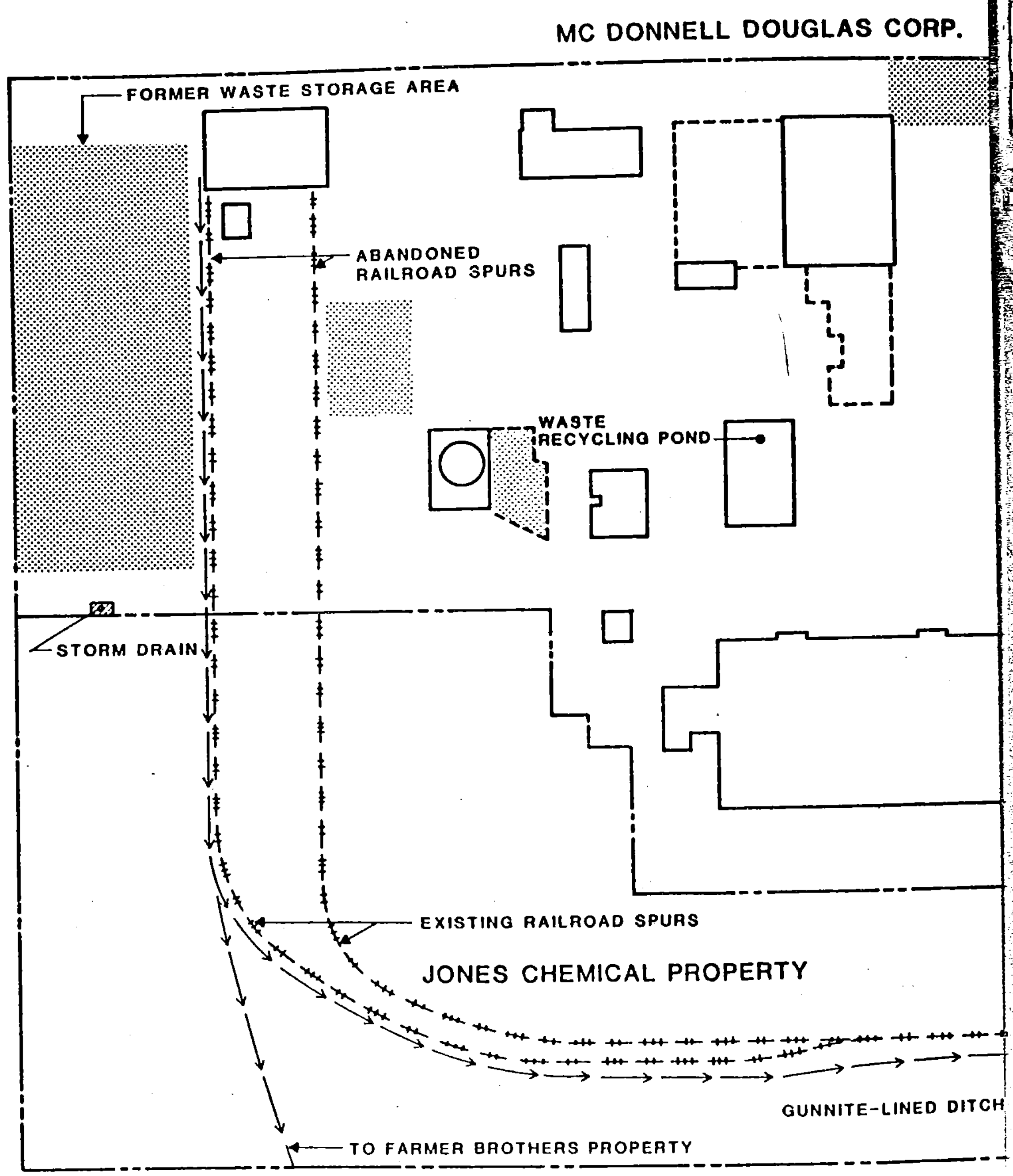


FIGURE 5
HISTORICAL DRAINAGE PATHWAYS



DRAINAGE PATHWAYS BASED ON STEREO AIR PHOTO INTERPRETATION AND REPORTED DATA.

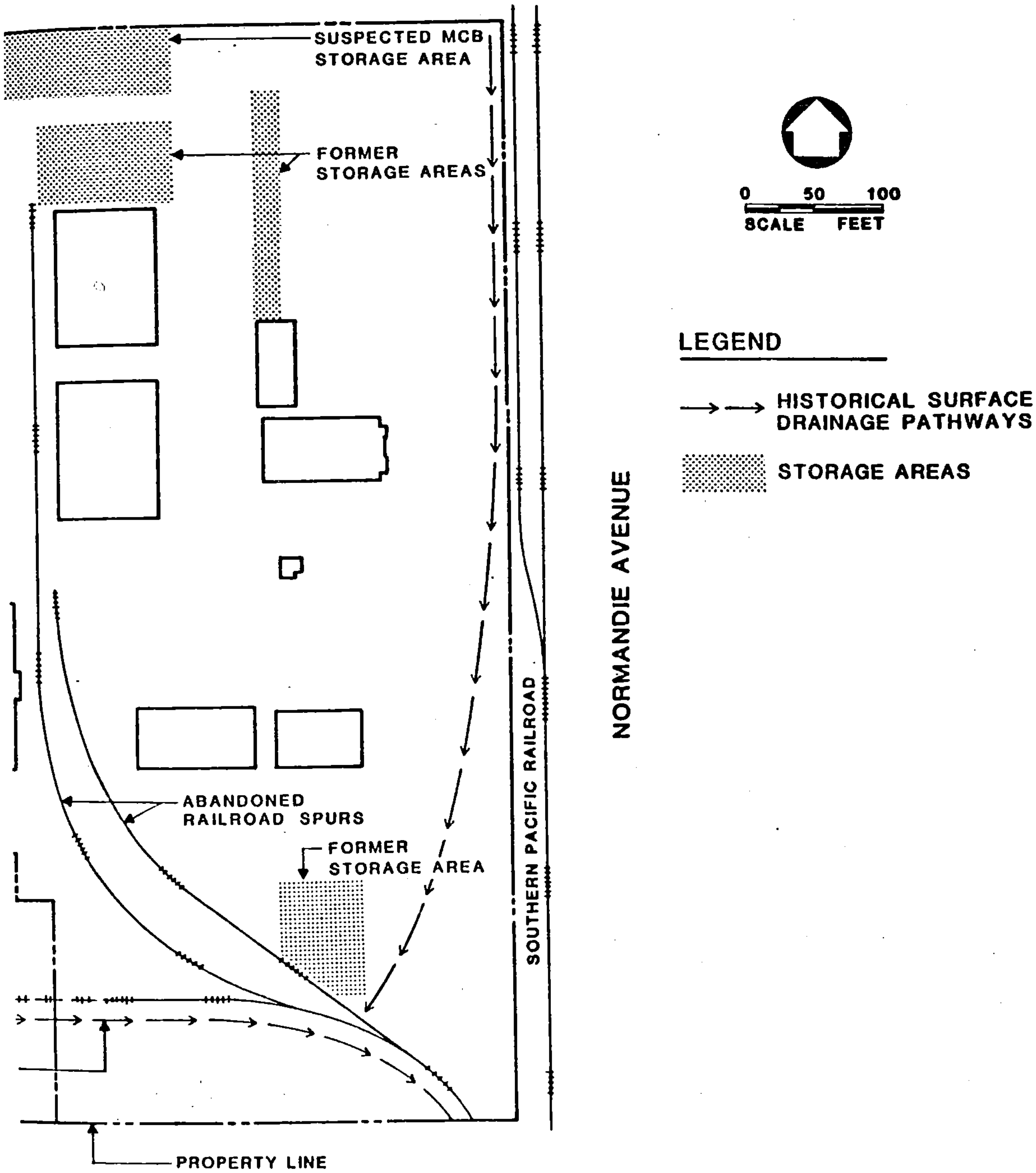


FIGURE 5
HISTORICAL DRAINAGE PATHWAYS

storm sewer beneath Kenwood Avenue. This storm drain system curves northeast across Torrance Boulevard where it enters Torrance Lateral and flows out to Dominguez Channel and via Consolidated Slip to the Los Angeles Harbor (Figure 1).

In 1983, Montrose built an earthen berm around the south and east boundary of the site to prevent runoff from leaving the property. Since April 1985, the entire site has been paved and contoured to direct stormwater to the eastern edge of the property. The drainage path then continues along a natural ditch to the catchbasin on the Farmer Brothers' property.

Adjacent Land Use

Prior to the 1930s, the principal land use was agriculture. By the early 1940s, after extensive drainage of this swampy area, industry was developing and residential areas were clustering around the farmlands. A large community based on light commerce and industry existed in the Torrance area by the 1960s-1970s. Currently, the Montrose site is surrounded by residential neighborhoods and industrial complexes. Immediately north of the site is McDonnell-Douglas Aircraft Company; to the southwest is Jones Chemical and Farmers Brothers Coffee. The land west of the site is unused property owned by McDonnell-Douglas and to the east along Normandie Avenue are single family residences and commercial properties. Southern Pacific Transportation Company owns railroad tracks along easements that bound the perimeter of the site on the north, south, and east. Los Angeles Department of Water & Power owns a 100-ft wide easement between Montrose and the Farmer Brothers' property.

TYPICAL PROPERTIES OF KNOWN CHEMICALS

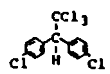
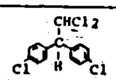
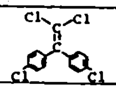
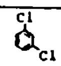
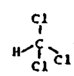
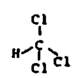
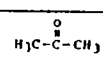
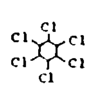
A brief description of general chemical characteristics, common use, and environmental fate processes is provided in this section for chemicals observed onsite or known to have been used by Montrose in the manufacture of DDT. Fate processes described here primarily focus on those processes occurring in aquatic surface environments; however, this information provides a useful basis for assessing contaminant movement in soil and groundwater environments. A summary of chemical properties of compounds of interest to this investigation is provided in Table 4. References used to generate this information are cited at the end of the main text and include references [29] through [38].

DDT and Metabolites

DDT mainly comprises a mixture of the pp'-DDT isomer (approximately 70%) and the o,p'-DDT isomer (approximately 18%). It is a colorless crystal or a white to slightly off-white powder and is odorless or has a slightly aromatic odor. DDT was introduced as an insecticide in 1943 to control malaria through the eradication of vectors. It was one of the most widely used agricultural insecticides in the United States and other countries from 1946 to 1972.

DDT is unusually stable in the environment due to its insolubility in water and its resistance to destruction by light and oxidation. Bioaccumulation of DDT in the biosphere is well documented, and is a particulary important fate process for DDT in aquatic systems. Analyses of environmental samples indicate that direct uptake, sorption to biota, and bioaccumulation in food chains result from DDT contamination [38].

Table 4. SUMMARY OF CHEMICAL DATA

Chemical name	Chemical formula	Molecular structure	Melting point	Boiling point	Density, g/mL	Vapor pressure	Solubility: In water	Solubility: In solvents	Coefficient: Water partition	Coefficient: adsorption	Bio-concent. factor	Aqueous photolysis
1,1,1-trichloro-2,2-bis (4-chlorophenyl)-ethane (DDT)	$C_{14}H_4Cl_5$		108.5-109.0°C	260°C	—[a]	1.5×10^{-7} mm Hg (at 20°C)	0.0017 ppm at 25°C	Acetone: 58 g/100 mL Benzene: 78 g/100 mL Chloro-benzene: 74 g/100 mL	log K_{ow} = 5.98	K_{oc} = 243,000	BCF = 29,400 at 32 days	Direct: 1/2 life of 150 yr. Indirect: <1 wk
1,1-dichloro-2,2-bis (4-chlorophenyl)-ethane (DDD)	$C_{14}H_{10}Cl_4$		112°C	—[a]	—[a]	10.2×10^{-7} torr (at 30°C)	0.002 ppm	Similar to DDT	log K_{ow} = 5.99	K_{oc} = 243,000 (est.)	BCF = 21,000 (est.)	1/2 life of 150 yr
1,1-dichloro-2,2-bis (p-chlorophenyl)-ethylene(DDE)	—[a]		88-90°C	—[a]	—[a]	6.5×10^{-6} torr (at 20°C)	0.087 ppm (est.)	—[a]	log K_{ow} = 5.69	K_{oc} = 473,000 (est.)	BCF = 51,000 at 32 days	1-6 days
Monochloro-benzene (MCB)	C_6H_5Cl		-45°C	131-132°C	1.1058 at 20°C	11.88 mm Hg (at 25°C)	0.049 ppm	Freely soluble in alcohol, benzene, chloroform, and ether	log K_{ow} = 5.98 (est.)	K_{oc} = 22,929 (est.)	BCF = 450 at 28 days	—[a]
1,2-dichloro-benzene	$C_6H_4Cl_2$		-17°C	180°C	1.3059 at 20°C	1 mm Hg at 20°C	Insoluble	Soluble in alcohol, ether, and benzene	log K_{ow} = 2.87 (est.)	K_{oc} = 868 (est.)	BCF = 89 at 14 days	—[a]
1,3-dichloro-benzene	$C_6H_4Cl_2$		-24.7°C	173°C	1.2884 at 20°C	1 mm Hg at 12.1°C	—[a]	Soluble in alcohol and ether	log K_{ow} = 2.78 (est.)	K_{oc} = 701 (est.)	BCF = 66 at 14 days	—[a]
1,4-dichloro-benzene	$C_6H_4Cl_2$		53.5-54°C	174.12°C	1.275 at 20°C	1.18 mm Hg	Insoluble	Soluble in alcohol, ether, benzene, chloroform	log K_{ow} = 2.64 (est.)	K_{oc} = 650 (est.)	BCF = 60 at 14 days	—[a]
Chloroform (trichloro-methane)	$CHCl_3$		-63.5°C	61.26°C at 20°C	1.484 at 20°C	200 torr at 25°C	1.0 g/100 mL at 15°C	Soluble in alcohol, benzene ether, carbon tetra-chloride	log K_{ow} = 1.98	K_{oc} = 285 (est.)	BCF = 6 at 14 days	—[a]
Benzene	C_6H_6		5.5°C	80.1°C	0.878 at 15°C	100 mm Hg at 26.1°C	Soluble in 1430 parts water	Soluble in alcohol, chloroform, ether, carbon tetra-chloride, acetone	log K_{ow} = 0.996 (est.)	K_{oc} = 83	BCF = 12.6	—[a]
Chloroform (trichloro-methane)	$CHCl_3$		-63.5°C	61.26°C at 20°C	1.484 at 20°C	200 torr at 25°C	1.0 g/100 mL at 15°C	Soluble in alcohol, benzene ether, carbon tetra-chloride	log K_{ow} = 1.98	K_{oc} = 285 (est.)	BCF = 6 at 14 days	—[a]
Benzene	C_6H_6		5.5°C	80.1°C	0.878 at 15°C	100 mm Hg at 26.1°C	Soluble in 1430 parts water	Soluble in alcohol, chloroform, ether, carbon tetra-chloride, acetone	log K_{ow} = 0.996 (est.)	K_{oc} = 83	BCF = 12.6	—[a]
Acetone (2-propanone)	CH_3COCH_3		-95.35°C	56.2°C	0.7899 at 20°C	168 mm Hg at 20°C	Soluble	Soluble in alcohol, chloroform	—[a]	—[a]	—[a]	—[a]
Benzene hexa-chloride (BHC) (hexachloro-cyclohexane)	$C_6H_6Cl_6$		112-309°C	288-233°C	1.87-89 at 20°C	Lindane; 9.4×10^{-6} mm Hg Isomers: $10^{-?}$-10^{-7} torr at 20°C	0.13-31.4 ppm at 25°C	Soluble in g/100 g at 20°C: acetone 43.5; benzene 28.9; chloroform 29.0; ether 20.8; ethanol 6.4.	—[a]	—[a]	—[a]	—[a]

a. Unavailable.

REFERENCES [23, 31, 38, 50, 51]

The most probable means of DDT transformation in the aquatic environment is through biotransformation and biodegradation. Biotransformation of DDT under anaerobic conditions occurs more frequently than under aerobic conditions. Transformation of DDT to DDD occurs more readily in anaerobic environments and DDE is the main metabolite in aerobic environments [38]. The dominant fate processes of DDT in the aquatic environment are adsorption to biota and sediments and volatilization. Adsorption is the primary fate process for DDT in anaerobic terrestrial (soil) environments. Rates of DDT adsorption to soils are difficult to determine since a large number of variables are involved. Laboratory and field studies have shown that volatilization of DDT from surface water occurs rapidly (available information indicates half-lives of less than 1 week) [38]. The principal byproduct of DDT volatilization is DDE, a process which likely accounts for major loss of the parent compound. DDT is soluble in body fat and bioaccumulates in various species. DDT is also soluble in MCB, acetone, and benzene (Table 4).

Indirect photolysis by natural substances in some aquatic systems may be important for DDT transformation with half lives on the order of a few days or hours [38]; however, specific half lives are difficult to predict due to the variability of natural waters. Hydrolysis occurs slowly, with an estimated half life of 12 years, suggesting that hydrolysis may be an important fate process under certain conditions of pH, temperature, and water chemistry. In laboratory experiments, the product of hydrolysis was DDE [38]. Oxidation of DDT in aquatic systems is not well documented; a half life of approximately 22 years has been calculated indicating that oxidation is not an important fate process for DDT [38].

DDD is the primary breakdown product of DDT and physically and chemically is very similar to DDT. The major fate processes for DDD in aquatic environments are bioaccumulation and sorption to sediments and biota. Volatilization of DDD from aquatic systems is also a means of DDD loss and occurs at about one-third the rate of DDT (DDD half lives range from a day to less than a month). Although a slow process, biotransformation of DDD in aquatic systems is likely the process resulting in ultimate degradation of DDT in the environment. DDD is more easily metabolized by organisms that DDE and DDT [38].

DDE is formed as a degradation product of DDT and is not manufactured as a commercial product. The major fate processes for DDE in aquatic environments are bioaccumulation and sorption to sediments and biota. Available information indicates that in aquatic systems, DDE may have volatilization half-lives of several hours and photolysis half-lives of several days. Thus, volatilization and photolysis are important loss processes for DDE when it has been desorbed from biota and sediment. DDE may also be degraded through biotransformation but at a much slower rate than DDT and DDD.

Monochlorobenzene

Monochlorobenzene (MCB) is a colorless, very refractive liquid with a faint almond-like odor [3] and is produced by the chlorination of benzene in the presence of a catalyst. It is used extensively in industry as a solvent and chemical intermediate in the manufacture of phenol, aniline, and DDT. MCB is also used as a heat transfer medium. It is insoluble in water but freely soluble in alcohol, benzene, chloroform, and ether. MCB has a density slightly heavier than water (Table 4) and therefore may sink through the water column if present in large quantities.

MCB has a high tendency to adsorb to and accumulate in fatty tissues and organic materials. It is reported to have a relatively low solubility at temperatures prevalent in ambient waters. As a result, volatilization, bioaccumulation, and sorption are expected to be competing fate processes. MCB probably volatilizes from aquatic systems to air at a relatively rapid rate (estimated half-life of 9 to 11 hours). Available information indicates that sorption processes may be substantial for MCB at pollutant concentrations anticipated in ambient waters. Available data also indicate that MCB has an intermediate potential for bioaccumulation in the lipids of tissues of living organisms. Biotransformation of MCB is expected to occur at a rate similar to that of DDT; however, some studies indicate that microorganisms growing on a separate food source could volatilize chlorobenzene at a more rapid rate [38].

Total Dichlorobenzenes

The chlorination of MCB produces a mixture of three dichlorobenzene isomers, including o-, m-, and p-dichlorobenzene (1,2-; 1,3-; and 1,4-dichlorobenzene, respectively). The isomers are separated through distillation and crystallization.

1,2-dichlorobenzene is a colorless liquid with an odor that is detectable at 50 ppm in air. It is used as a solvent for waxes, gums, resins, tars, rubbers, oils, and asphalts; as an insecticide for termites and locust borers; as a fumigant to remove sulfur from illuminating gases; as a degreasing agent for metals, leather, wool; as an ingredient of metal polishes; as a heat transfer medium; and as an intermediate in the manufacture of dyes. 1,2-dichlorobenzene is insoluble in water but soluble in ethanol, benzene, and diethyl ether.

1,3-dichlorobenzene is a colorless liquid; it is insoluble in water but soluble in alcohol and ether. 1,4-dichlorobenzene is a colorless or white crystal with a characteristic penetrating odor detectable at 15 to 30 ppm in air. 1,4-dichlorobenzene has been widely used as an insecticide (particularly against clothes moths), disinfectant, deodorant, and a chemical intermediate. It is insoluble in water but soluble in alcohol, ether, benzene, chloroform, and carbon disulfide.

The environmental fate of 1,2-, 1,3-, and 1,4-dichlorobenzenes is expected to be the same as that discussed for MCB because these compounds are chemically similar. The addition of chlorine to form dichlorobenzene does not significantly alter the chemistry to affect transport processes. That is, sorption, bioaccumulation, and volatilization are expected to be competing processes; however, the predominant environmental fate of 1,2-, 1,3-, and 1,4-dichlorobenzene has not yet been determined [38].

Chloroform

Chloroform is a highly refractive, nonflammable, heavy, very volatile, sweet-tasting, colorless liquid with a characteristic odor. It is produced by adding sulfuric acid to acetone and bleaching powder or by carefully controlled chlorination of methane. Low levels of chloroform can also be produced by chlorinating water and sewage. In the past, chloroform was used as an anesthetic; its current uses include limited use as a solvent for fats, oils, rubbers, alkaloids, waxes, resins; as a cleansing agent; in fire extinguishers to lower the freezing temperature of carbon tetrachloride; and as a chemical intermediate, particularly in the rubber industry. Chloroform is highly soluble in water and soluble in ethanol, ethyl ether, benzene, acetone, and carbon disulfide. Although chloroform is not known to have been used in the manufacture of DDT, it may have been used as a solvent for other reasons such as equipment cleaning or as degreasers.

The primary transport process for chloroform from the aquatic environment is through volatilization into the atmosphere as a result of its high vapor pressure. Its primary fate is photooxidation in the troposphere by hydroxl radicals, resulting in the formation of phosgene and chlorine oxide as principal products. Photolysis, hydrolysis, and sorption are not significant fate/transport processes for chloroform. Significant bioaccumulation or biotransformation, and biodegradation of chloroform do not occur in an aquatic environment.

Benzene

Benzene is a clear, colorless, highly flammable liquid with a characteristic odor. It is produced in billion gallon quantities per year through the coking of coal, fractionated distillation from crude oil, and solvent extractions or crystallization catalytic dehydrogenation/reforming of light napthas, paraffins and cycloolefins. Benzene is used mainly in chemical processes as a raw material and as a solvent in industry and commerce. Benzene is used in the manufacture of ethylbenzene, styrene, cumene, phenolic resins, ketones, adipic acid, nylon, dyes, artificial leather, linoleum, varnishes, lacquers, and other organic compounds. It is soluble in water, alcohol, chloroform, ether, carbon tetrachloride, and acetone [31, 38]. Although benzene has a lower density than water, it is also soluble in water and may be expected to remain at or near the water surface.

Volatilization appears to be the major transport process of benzene from the aquatic environment to the atmosphere. Photooxidation of benzene by hydroyl radicals following volatilization is the predominant fate process. Since benzene is soluble in water, some benzene is expected to persist in the aquatic environment. That portion of benzene which persists in water will likely biodegrade at a slow rate, although the biodegradation rate is enhanced by the presence of other hydrocarbons. Available data indicate that photolysis, hydrolysis, and bioaccumulation of benzene are not significant fate/transport processes. The log octanol/water partition coefficient for benzene indicates that significant sorption of benzene by sedimentary organic material may occur, although no specific studies have been performed to verify the extent to which this occurs.

Acetone

Acetone is a volatile, highly flammable liquid with a characteristic odor and pungent, sweet taste. It is produced by fermentation during the manufacture of butyl alcohol or by chemical synthesis from isoproposanol, cumene, and propane. Acetone is used as a solvent for fats, oils, waxes, resins, rubber, plastics, lacquers, varnishes, and rubber cement; in the manufacture of methyl isobutyl ketone, mesityle oxide, acetic acid, diacetone alcohol, chloroform, iodoform, bromoform, explosives, airplane dopes, rayon, photographic films, and isoprene; for storing acetylene gas; in the manufacture of paint and varnish removers; and in purifying paraffin [31]. Acetone is soluble in water, alcohol, dimenthylformanide, chloroform, ether, most oils. Although acetone is not known to have been used in the manufacture of DDT, it may have been used as a solvent for other reasons such as equipment cleaning or as degreasers.

Acetone is highly volatile and very soluble in water. The dominant fate process for acetone in aerobic soil environments is expected to be volatilization. In groundwater environments, however, acetone is more likely to dissolve rapidly in water and remain in the dissolved state.

Benzene Hexachloride (BHC) and Isomers

BHC is a family of isomers of hexachlorocyclohexane. The gamma-BHC isomer, commercially called lindane, is the most toxic of the isomers. The other three major isomers, all present in commercial BHC, are alpha-BHC, beta-BHC, and delta-BHC. BHCs are a chlorination product of benzene. All the isomers are crystals with melting points ranging from 112 to 309 degrees Celsius exhibit very low volatility, and are slightly soluble in water. Lindane has a slightly musty odor. Technical BHC is a combination of the isomers and is used as a pesticide.

Adsorption to sediments appears to be a major transporting mechanism in an aquatic environment. In addition to sorption, biodegradation is also an important process to the transport and transformation of isomers. The adsorbed and biodegraded metabolites of lindane (gamma-BHC) include the other isomers of BHC and dechlorination to various isomers of penta- and tetra-chlorocyclohexane, as well as penta- and tetra-chlorobenzene. Bioaccumulation appears to be substantial. Photolysis, oxidation, and hydrolysis of all isomers does occur, but these reactions are not considered an important process.

FIELD INVESTIGATION

The field program was conducted by USEPA during the period June 18 to July 9, 1985. A series of air, soil, and groundwater quality measurements were made at both onsite and offsite locations. This investigation was supplemented with a more limited groundwater investigation was performed by USEPA during the period August 13-14, 1985. The following sections on soils and hydrogeology discuss the results of analytical data from these investigations. Sampling methodology, locations, and measurements are presented in Appendix A. The sample numbering system used in the field investigation is presented in Appendix D. Photoionization detector measurements are presented in Appendix G.

Significant chemical concentrations found in soils and groundwater are presented in Tables 5 and 6. The data in Table 5 are from borehole 24D which had the highest chemical concentrations. Results of laboratory and onsite soil analyses are presented in Appendix E. The groundwater chemistry is presented in Appendix F. USEPA conducted the QA/QC for all data analyzed during this field program. Some of the data have been designated the letter "J" which means that the data are useful for limited purposes. There are several reasons for assigning "J" values to the analytical data, for example:

1. Some samples were not analyzed within the designated holding times.

2. Some blank water samples had detectable levels of contaminants. For every groundwater sample taken from a well, one blank sample of organic-free water was also collected. The following methods were used for contaminated blanks:

   - Where common laboratory contaminants (e.g., methylene chloride) were detected in blank samples, the detected value was multiplied by 10; groundwater samples collected with these blanks are valid for limited purposes for concentrations higher than the new value assigned to the blank.

   - Blank sample results showing concentrations of uncommon laboratory contaminants (e.g., benzene) were multiplied by 5. The groundwater samples collected with these blanks are valid for limited purposes for concentrations higher than the new value assigned to the blank.

Table 5. SUMMARY OF CHEMICALS IN SOILS
Borehole 24D[a]
ug/kg

Sampling depths ,ft	DDT	DDD	DDE	Chloro- benzene	Acetone	Chloro- form	Total dichloro- benzene	Benzene
1.0-1.5	880,000	52,000	200,000	1,100	—	—	370J	—
1.5-2.0	$2.0X10^6$	100,000	550,000	7,000	—	—	1,500J	—
2.5-3.0	$1.2x10^6$	53,000	120,000	7,100	—	--	690J	—
4.5-5.0	$3.8x10^6$	130,000	530,000	20,000	4,600J	—	--	--
5.5-6.0	44,000	2,100	7,400	160	37J	51J	660	—
6.0-6.5	40 40	20	260	—	--	250J	—	
7.5-8.0	300 40	100	2,700	--	—	300J	—	

Table 5 (Concluded)

Sampling depths ,ft	DDT	DDD	DDE	Chloro-benzene	Acetone	Chloro-form	Total dichloro-benzene	Benzene
9.0-9.5	4,700	230	4,700	1,100	97J	21J	4,660	—
9.5-11.0	$4.2x10^6$	260,000	$2.2x10^6$	$16.0x10^6$	—	—	370,000J	—
11.5-12.5	$1.3x10^6$	30,000	630,000	$12.0x10^6$	63J	—	260,000	—
14.0-14.5	$6.5x10^6$	200,000	$1.9x10^6$	$3.3x10^6$	—	—	65,000J	—
15.5-16.0	$3.1x10^6$	180,000	820,000	$2.8x10^6$	—	—	66,000J	—
16.0-16.5	$1.2x10^6$	88,000	240,000	$2.9x10^6$	—	—	42,000J	—
17.5-18.0	$1.9x10^6$	67,000	250,000	$4.6x10^6$	—	—	64,000	—
19.0-19.5	120,000	6,000	29,000	29,000	—	—	2,200J	—

Note: J = limited purposes only; — = no results reported.
a. Highest concentrations of chemicals represented by borehole 24D, remaining soil data presented in Appendix E.

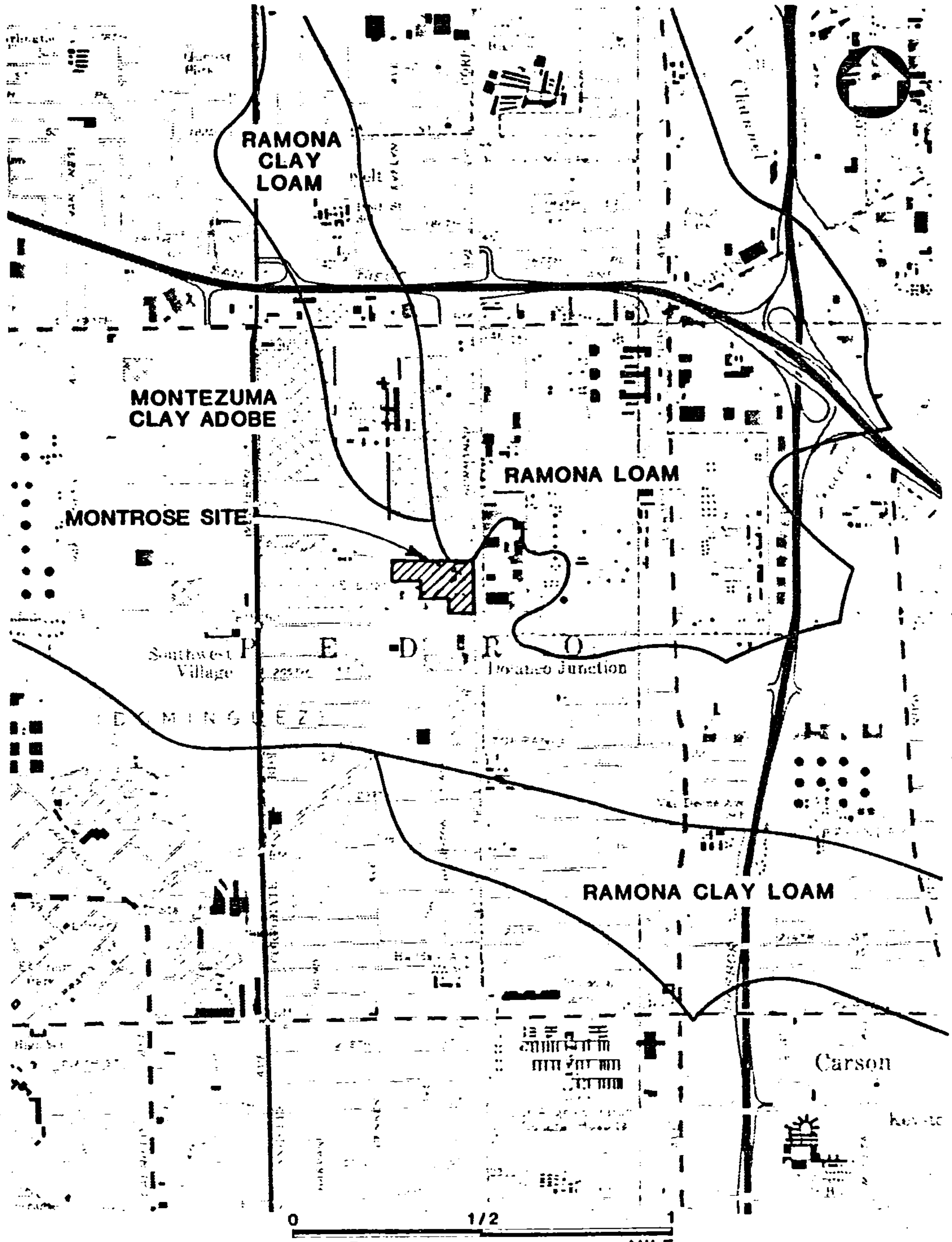
Table 6. SUMMARY OF CHEMICALS IN GROUNDWATER
ug/L

Monitoring well	DDT	DDD	DDE	Chloro-benzene	Acetone	Chloro-form	Total dichloro-benzene	Benzene
MW-1	20	10	10	2,500	5,100	2,500	123J	5,000
MW-2	4,500	410	65J	310,000	14,000	5,900	736	ND
MW-3	3	0.38	0.1	25	150J	750	60	80
MW-4	1.1	0.15J	1	100	60J	4,400	60	ND
MW-5	10	10	10	110,000	5,800	22,000	180J	1,700
OW-1	0.1	0.1	0.1	5	10J	5	5	ND
OW-2	0.1	0.1	0.1	5	450	4J	5	ND

Notes:
ND = not detected.
J = limited purposes only.

SOILS

Soil characterization is essential to the understanding of the processes that take place within the soil profile. As shown in Figure 6, the Montrose site is located at or near the boundary of three soil series: Ramona loam, Ramona clay loam, and Montezuma



REFERENCE:
U.S. DEPARTMENT OF AGRICULTURE.
SOIL SURVEY, 1919

FIGURE 6. SOILS MAP

clay adobe [4]. The principal soil type found at the Montrose site is the Montezuma clay adobe. Descriptions of these soil types are located in Appendix E.

The native soils are typically fine textured, loams, clay loams, and clays, grading to even heavier clays in the subsoil. In places, the subsoil is partially cemented, often resembling a hardpan. Surface and internal drainage is poor to moderate; prior to capping of the site, soil characteristics favored generation of surface runoff, particularly during intense storms. The combination of fine texture and small quantities of organic matter creates a relatively high surface area to volume ratio, increasing the potential for sorption of contaminants as they percolate through the soil.

The geology of the upper 20 feet of the site has been verified from 17 soil borings drilled during this investigation. Lithologic data are also available for depths greater than 20 feet from drillers' logs on file at Department of Water Resources and Los Angeles County Flood Control District and from the borehole logs recorded by Montrose (well logs presented in Appendix C).

Geologic logs from soil borings and wells drilled by Montrose Chemical Corporation (April 1985) indicate that the sediments underlying the site are combinations of brown silty sand, silty clay, and clayey silt up to 30-ft thick. The sediments are typical of floodplain deposition in a low energy environment with varying amounts of gravel, debris, and unidentified black, purple, and white residues in the upper 10 feet.

Field estimates of the hydraulic conductivity of these sediments are generally low, on the order of 10^{-3} to 10^{-6} cm/s, due to the high percentage of clays and fine-grained material.

At location 24D, purple stained soils were noted by USEPA field geologist at depths below 10 feet, and may correspond to depths approximately equal to the historical freeboard level of the adjacent surface impoundment. Purple stained soils were also noted by a USEPA field geologist during grading operations at a depth of 1 to 1-1/2 feet located toward the central south end of the site.

Physical Description of Soils

Boring logs for all onsite samples are presented in Appendix B. Typically the soil sequence to a depth of 10 feet was asphalt underlain by imported sand and gravel road base, fill, native silty clay to fine sandy silt based on the United States Department of Agriculture soils classification system (USDA). Corresponding soil classifications using the Unified Soil Classification System (USCS) would be:

ML - Inorganic silts, very fine sands, rock flour, silty or clayey fine sands

CL - Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays

SM - Silty sands, sand-silt mixtures).

Caliche, iron oxide and (possibly) manganese oxides were present throughout the site at concentrations ranging from trace to abundant. Native soil characteristics were in general agreement with those mapped for the area.

A summary of grain size analyses for a number of onsite samples is presented in Table 7. Although a complete laboratory classification was not possible due to lack of liquid limit determinations, laboratory grain size analyses are in general agreement with corresponding field classification.

Table 7. MONTROSE GRAIN SIZE ANALYSES

PERCENT CLAY TO FINE RATIO

Sample	Location[b]	Fines	<0.001 clay/fines
1765Y-			
98	21D 2.5	52.9	20.9/39.5
99	21D 4.5	61.4	16.1/26.2
100	21D 8.5	93.9	28/29.8
101	34D 2.5	55	18/32.7
102	34D 5.5	72.7	24/33.0
103	34D 8.5	82.4	42.2/51.2
104	46D 2.5	76.2	23.8/31.2
105	46D 4.0	80.6	34.1/42.3
106	46D 9.0	71	18/25.4

PERCENT MASS OF SAMPLE RETAINED ON SCREEN SIZES LISTED

Sample	Location & depth, ft[b]	% dry weight	Screen size, mm 4.75	2	0.85	0.425	0.25	0.16	0.075	0.005	0.001	<0.001	Gravel[a]	Sand[a]	Fines[a]
1765Y-															
98	21D 2.5	81	19.3	3.3	1.2	2.6	3.2	11.5	5.9	27.7	4.3	20.9	19.3	27.7	52.9
99	21D 4.5	86	0.1	0.6	0.1	0.5	3	23.5	10.9	36	9.3	16.1	0.1	38.6	61.4
100	21D 8.5	78.9	0.1	0.1	0.3	0.7	0.6	1.9	2.6	44.9	21	28	0.1	6.2	93.9
101	34D 2.5	84.4	20.3	3.3	1.5	2.9	3	9	4.9	30.1	6.9	18	20.3	24.6	55
102	34D 5.5	82.6	7.7	2	0.5	1.9	2.5	7.6	5	37.7	11	24	7.7	19.5	72.7
103	34D 8.5	84.7	0.1	0.1	0.3	0.8	1	7.9	7.6	37.6	2.6	42.2	0.1	17.7	82.4
104	46D 2.5	88	0.5	1.4	0.5	1.7	2.6	11.5	5.6	42.1	10.3	23.8	0.5	23.3	76.2
105	46D 4.0	80.2	0.1	0.1	0.1	0.3	1.3	11.4	6.4	36	10.5	34.1	0.1	19.6	80.6
106	46D 9.0	81.5	0.1	0.1	0.1	0.3	2.1	17.4	9.2	43.6	9.4	18	0.1	29.2	71

a. Gravel, sand, and fines classified according to Unified System: gravel = >4.75 mm; sand = 0.075–4.75 mm; fines (silt and clay) = <0.075 mm.
b. Locations of boreholes are shown in Figure 7.

As is observed from Table 7, grain size distribution is somewhat variable over the site. However at all locations, sample grain size decreases with increasing depth. Lateral variability appears to be associated primarily with the shallow (2.5 ft) depth interval, and may reflect the influence of grading operations and fill placement which have had a non-uniform influence over surface and near surface onsite locations.

The distribution of clays (<0.001 mm particles) relative to total fines is presented in Table 7. The clay to total fines ratio is generally between 25 and 50%. Given the typically high surface area to volume ratios of clays relative to gravels, sands and silts, this grain size fraction probably plays an active role in soil-chemical interactions, particularly those related to surface phenomena: adsorption or exchange.

In addition to their effect on surface related sorption properties, increased clay concentration was often associated with increased soil mottling, suggesting an apparent cause and effect relationship between clay content and internal drainage.

Similar field observations were made with respect to increasing calcium carbonate (caliche) concentrations in the soil. Internal drainage was neither uniform throughout the site, nor within a single location, and reflected local concentrations of clay and caliche.

Onsite Organic Vapor Analyses

Organic vapor analyses were taken at borehole locations with a photoionization detector (HNu). HNu readings are presented in Figure 7. As is observed from the figure, highest downhole HNu readings were associated with locations in and around historical production areas and waste disposal (surface impoundment) locations (see Figure 2). In addition, these higher readings appear to coincide with current building pad locations. Highest HNu readings were generally associated with a surface layer of fill that often showed visual evidence of staining and odors suggesting chemical contamination.

Although high HNu readings were generally associated with the surface soils, even higher readings were noted at depths below 10 feet at locations surrounding the former surface impoundment.

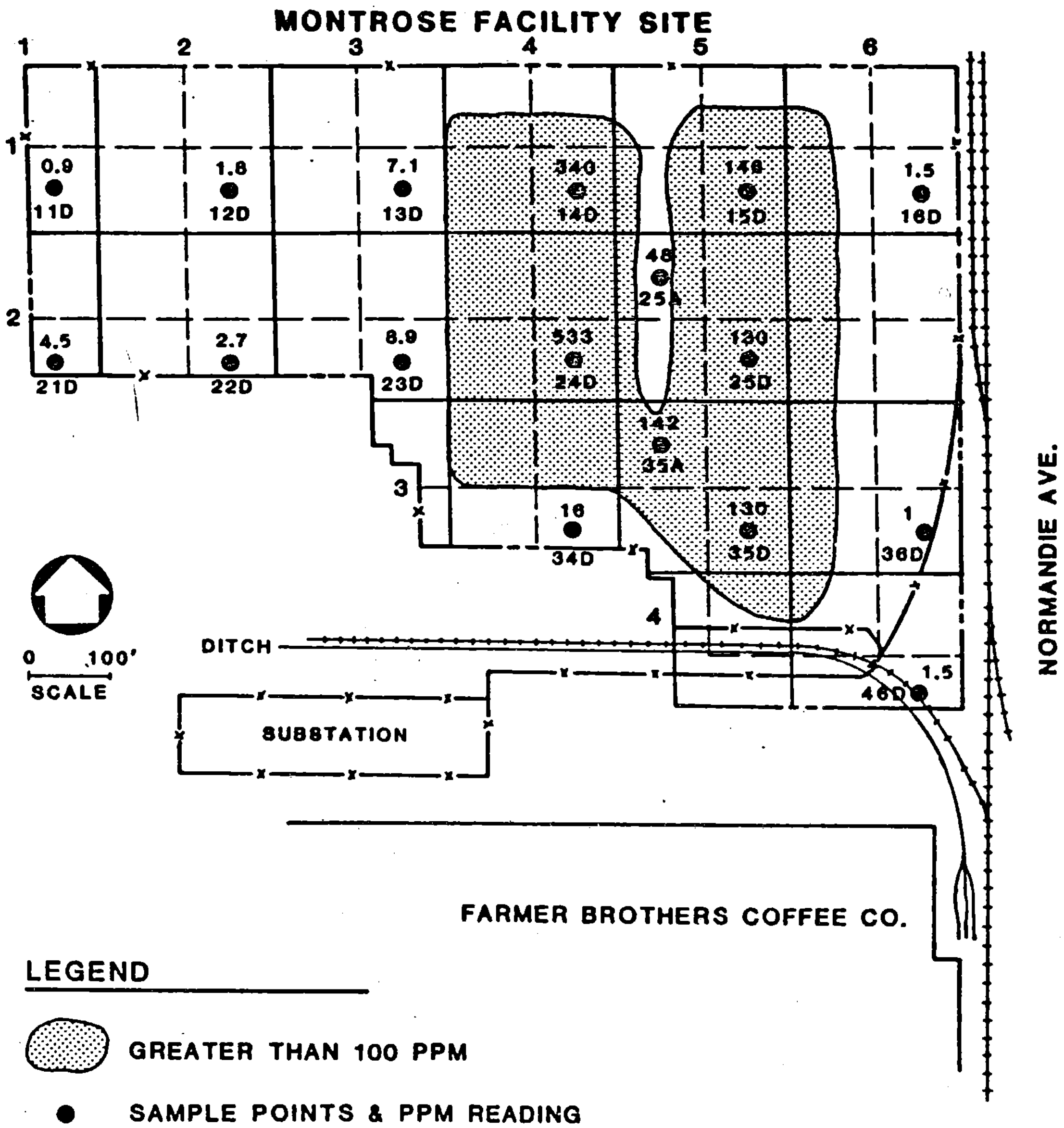


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FIGURE 7. MAXIMUM SOIL BORING
HNu READINGS AS PPM BENZENE

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Organic Chemicals Detected in Soils

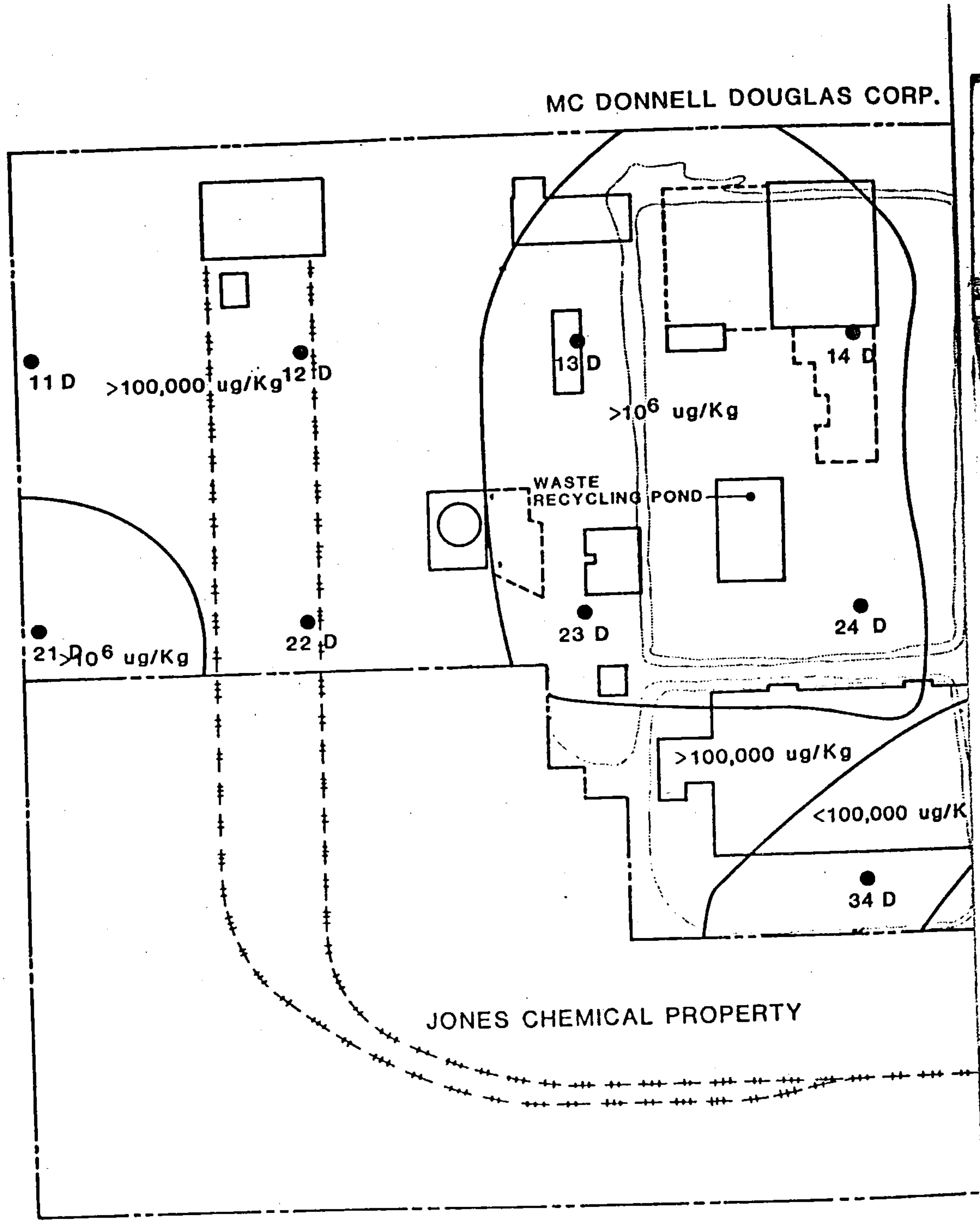
Purple stained soils were observed at the same locations as high HNu readings. Among the 47 organic chemicals detected at quantifiable concentrations, only 10 were routinely detected. These chemicals are listed below.

DDT
DDD
DDE
Chlorobenzene (MCB)
Dichlorobenzene (isomers)
Chloroform
Acetone
BHC (isomers)
2-Butanone
Methylene Chloride

Of these, there is a possibility that both methylene chloride and 2-butanone result from laboratory contamination and their distribution is not discussed further. Similarly, only a limited data base is available for the BHC isomers and their distribution is not discussed in detail.

The aerial and vertical distribution of DDT found in onsite soils is presented in Figures 8 through 11 and is representative of most chemical distributions onsite. These figures are supplemented with figures presented in Appendix E, which depict aerial and vertical trends in individual soil chemistry parameters for the other chemicals commonly found onsite. Boundaries represented in these figures are approximate and are drawn to be consistent with historical surface features.

They are not meant to be interpreted as precise boundaries, but are presented strictly for conceptual purposes. In addition, only maximum detected concentrations for each depth interval are shown on each figure. Therefore, vertical distributions often appear more continuous than they really are.



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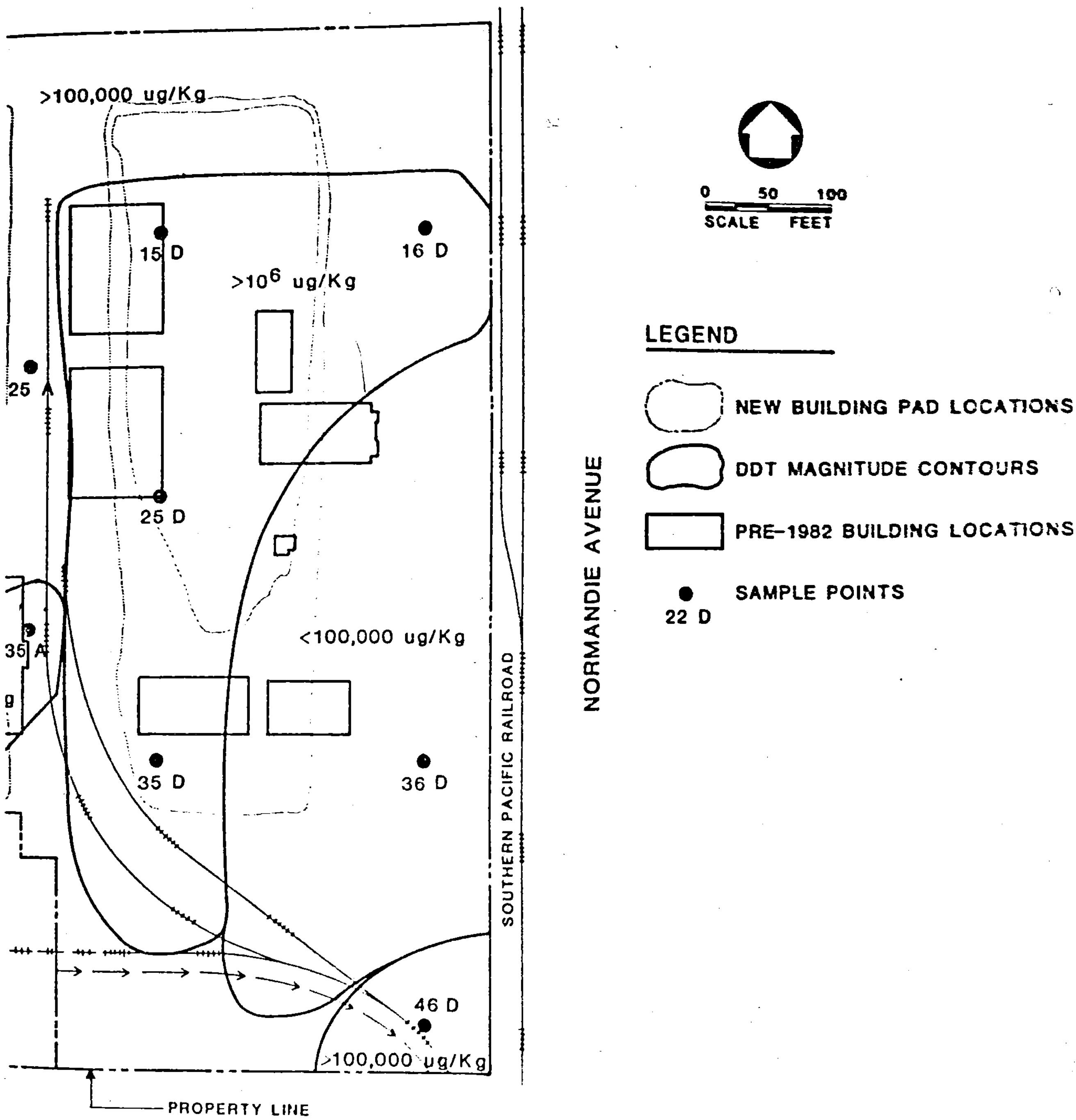
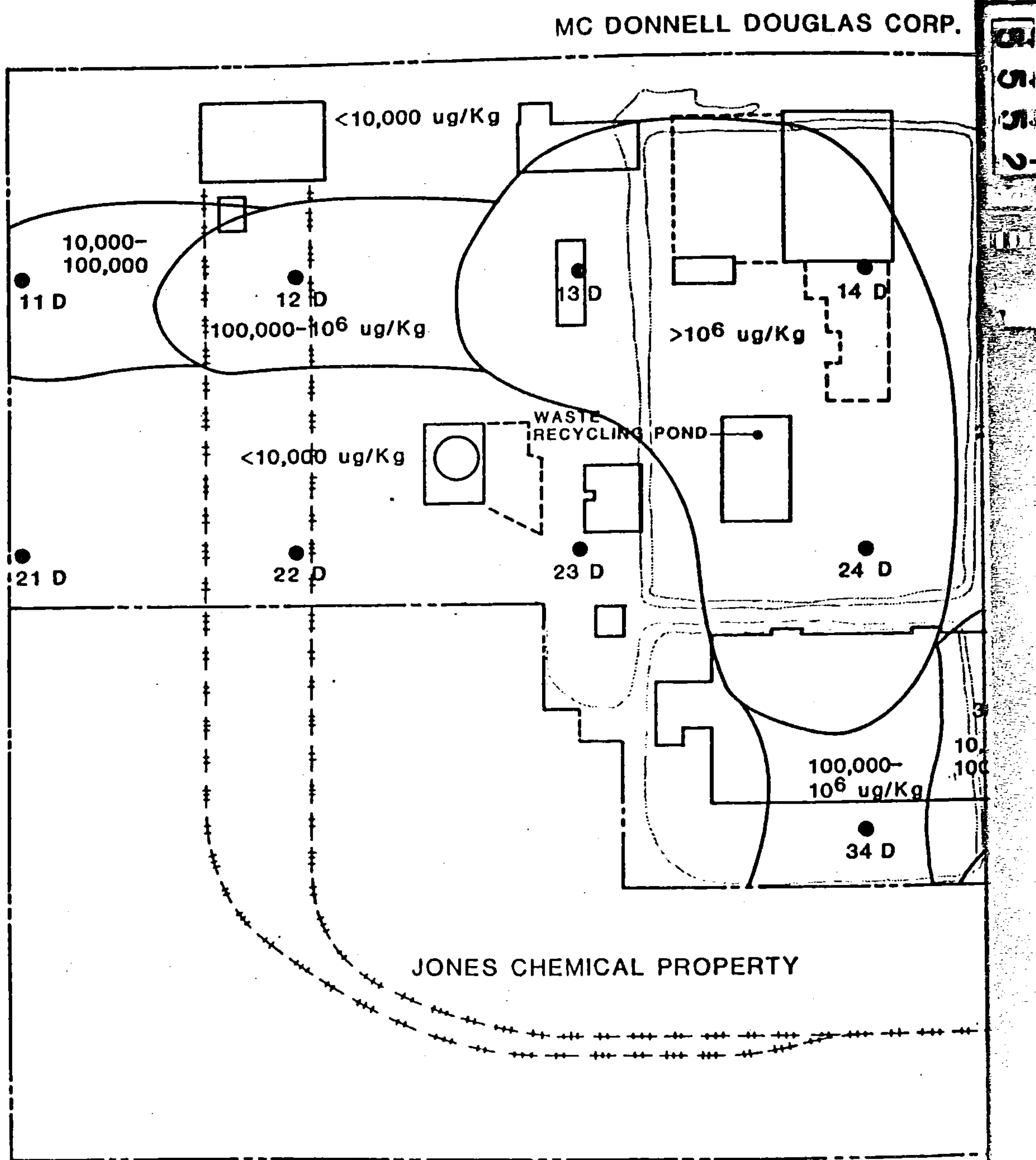


FIGURE 8
ORDER OF MAGNITUDE
INTERPRETATIONS OF DDT DATA
(SOILS) 0-2.99 FT DEPTH



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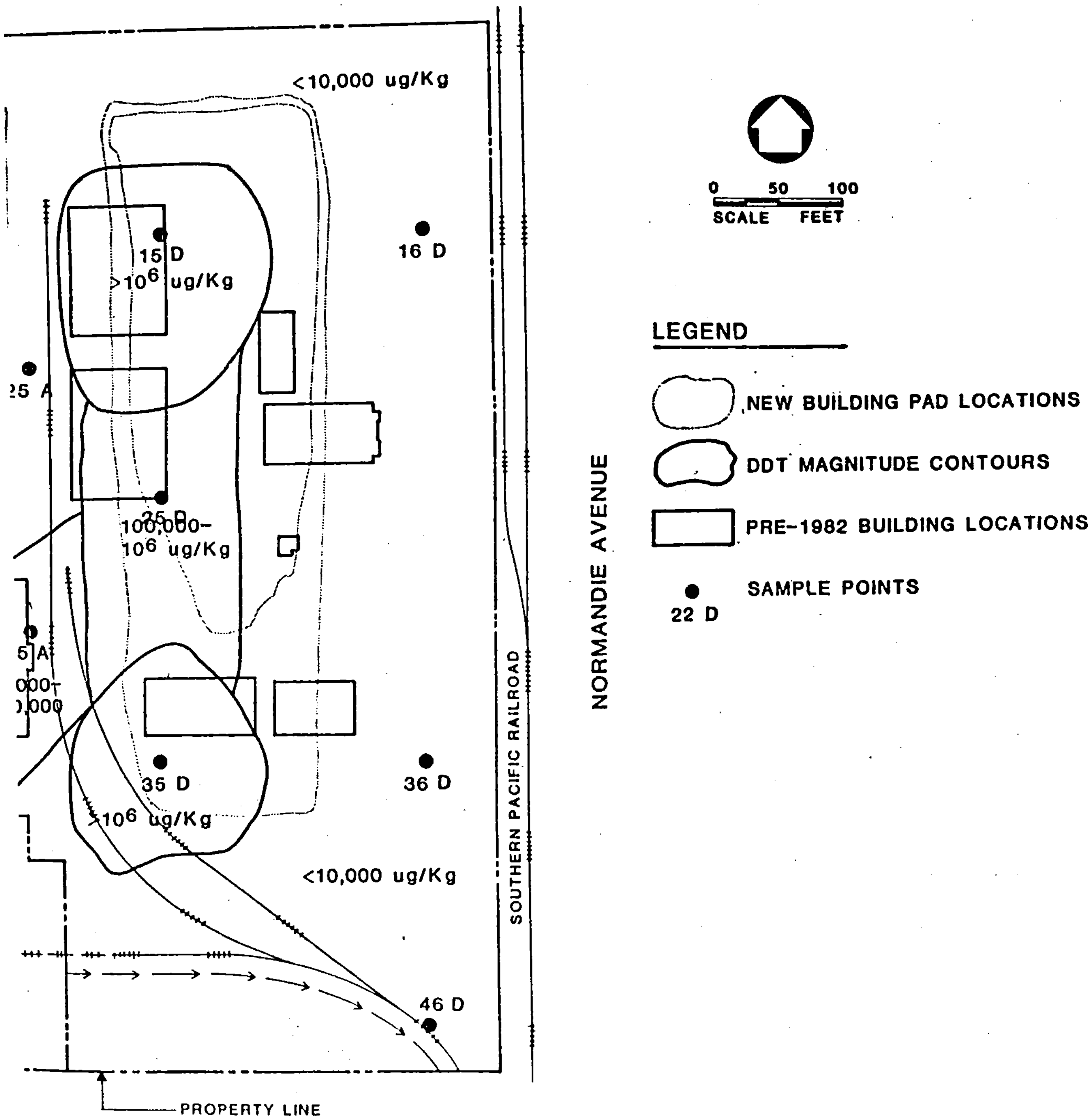
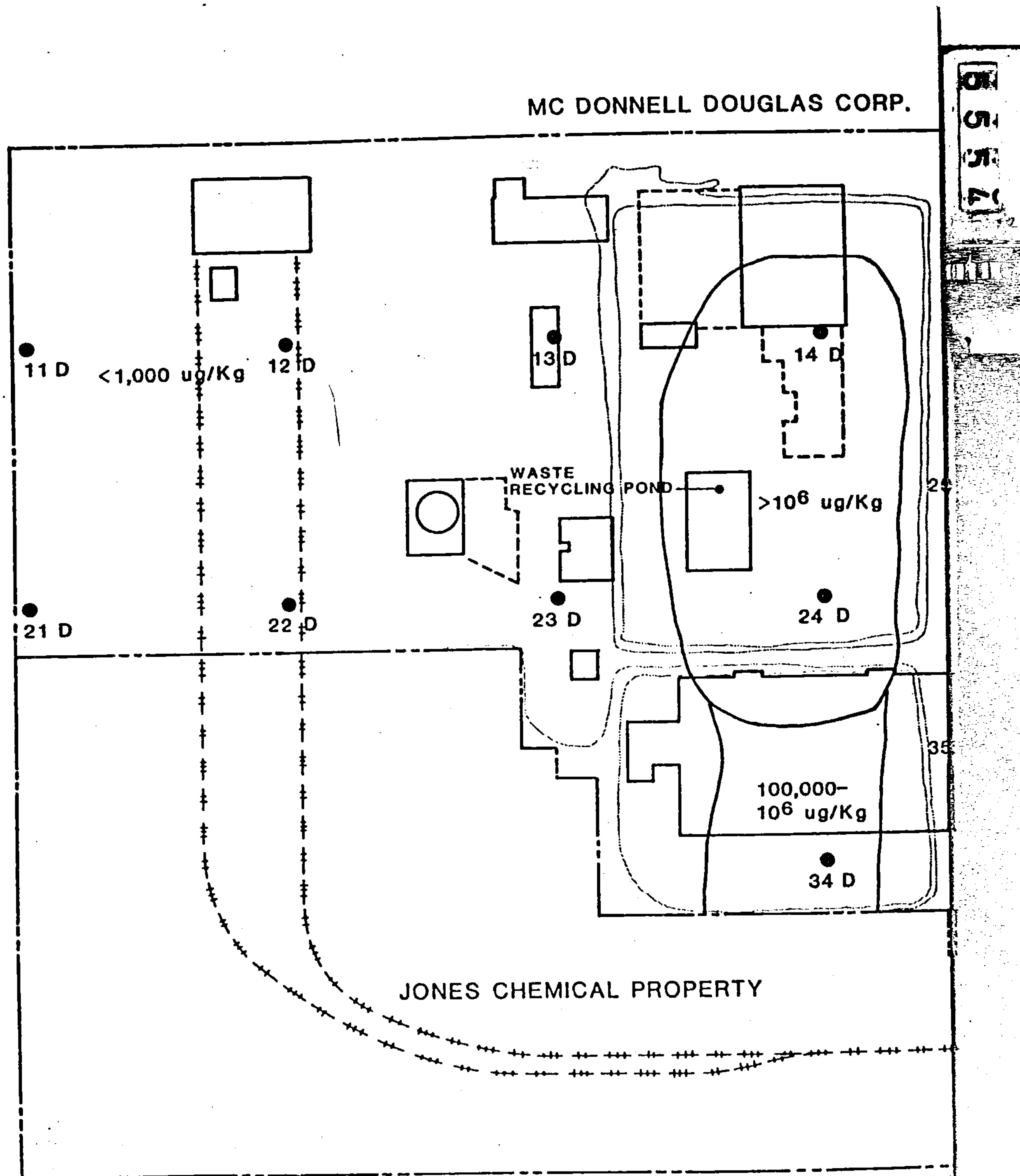


FIGURE 9
ORDER OF MAGNITUDE
INTERPRETATIONS OF DDT DATA
(SOILS) 3-5.99 FT DEPTH



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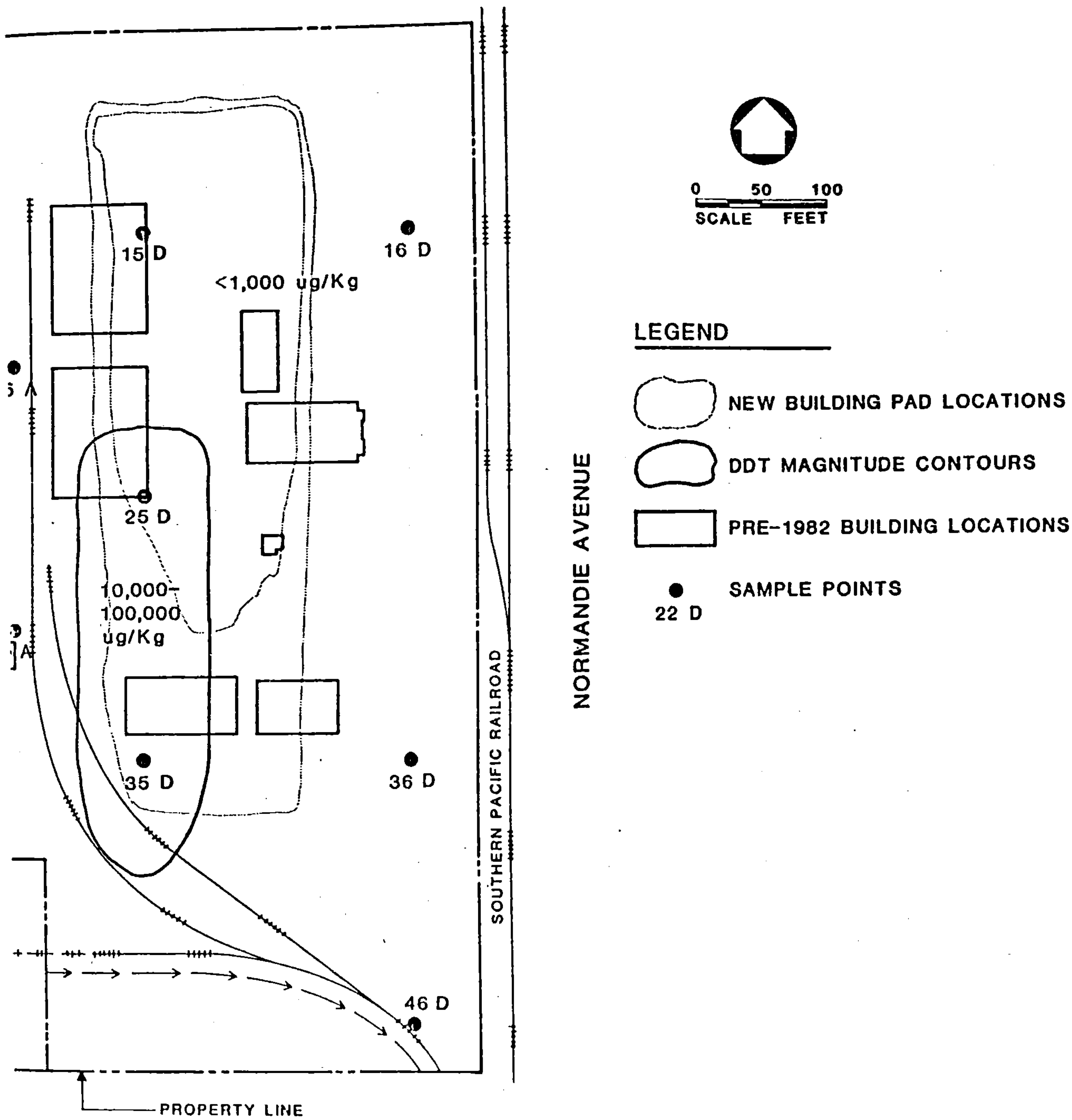
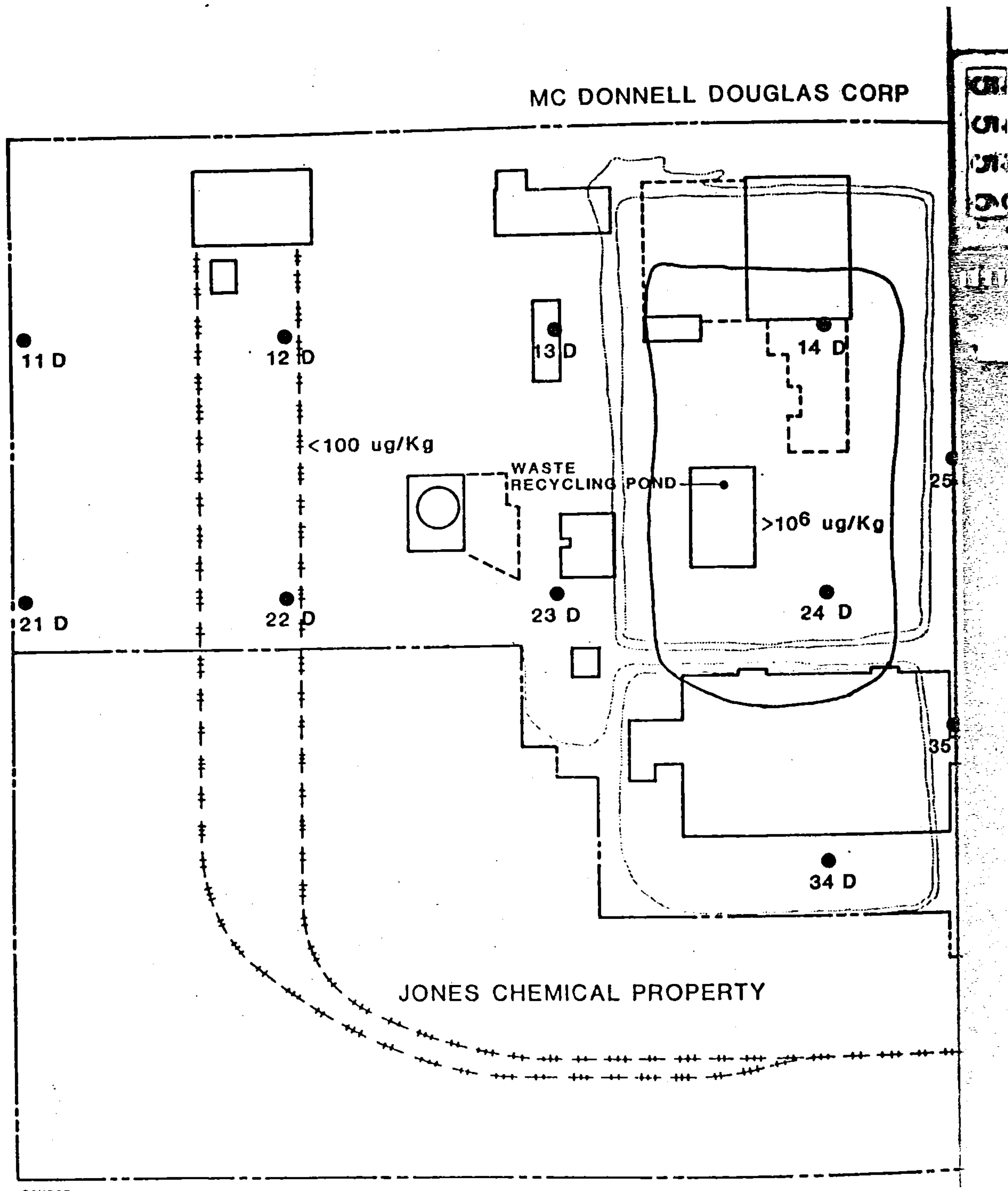


FIGURE 10
ORDER OF MAGNITUDE
INTERPRETATIONS OF DDT DATA
(SOILS) 6-9.99 FT DEPTH



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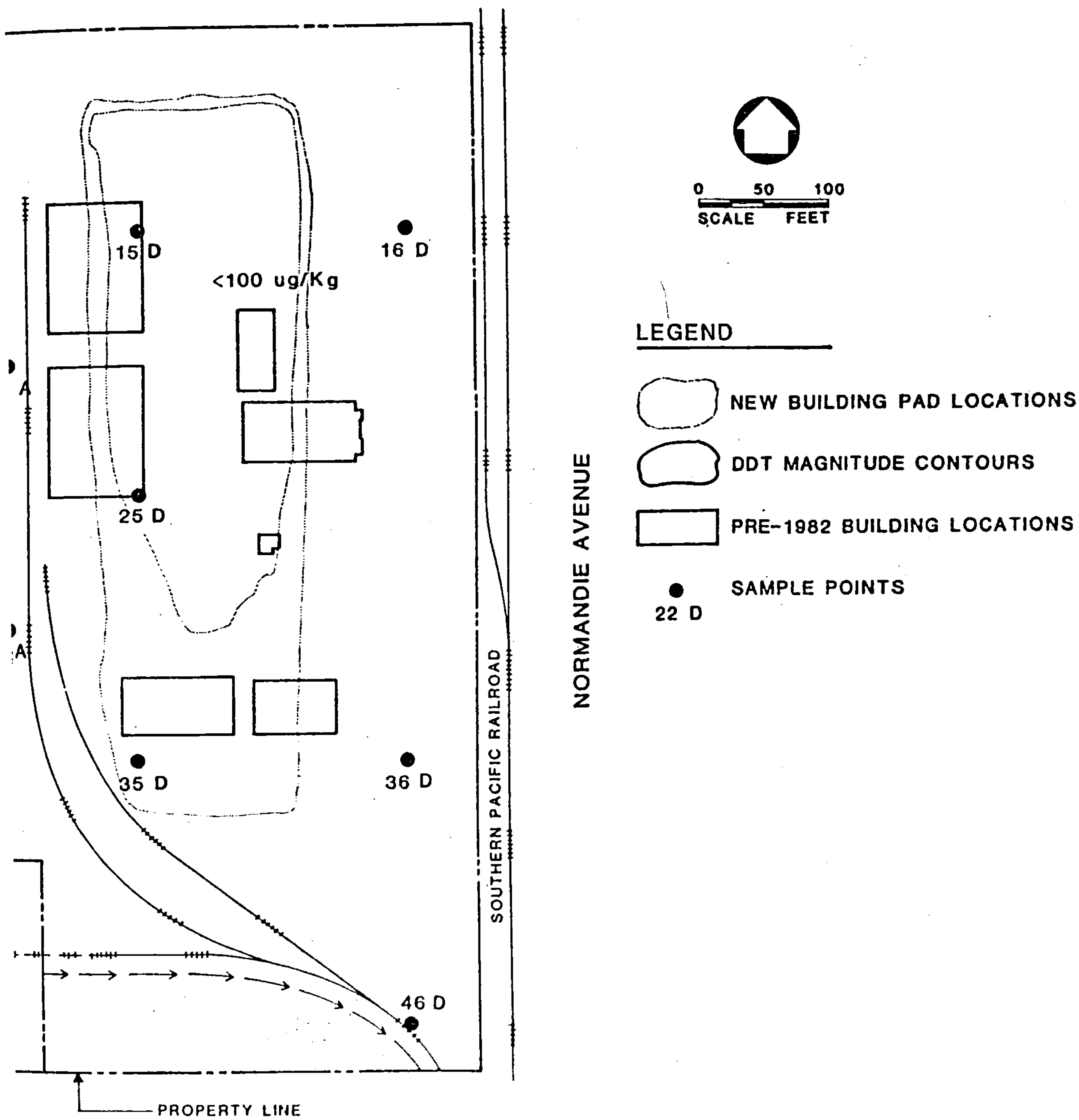


FIGURE 11
ORDER OF MAGNITUDE
INTERPRETATIONS OF DDT DATA
(SOILS) >10 FT DEPTH

Trends were based primarily on assessment of maximum recorded chemical concentrations at each depth interval. However, concentration-depth relationships are often non-continuous and show local highs and lows, that may be related to past operational practices, grading, complex geologic conditions and/or local unsaturated zone transport phenomena.

Several trends are apparent in the figures. For DDT, quantifiable concentrations were detected at all surface (0-2.99 ft) sampling locations. Generally however, highest surface concentrations of these chemicals coincide with areas of historical production facilities, historical waste disposal locations, and current building pad location areas where grading and fill operations have apparently resulted in the incorporation of order of magnitude higher concentrations of DDT contaminated soils relative to other portions of the site. With the exception of boring locations adjacent to the former surface impoundment, concentrations of DDT and most target chemicals decrease rapidly with depth. Montrose Chemical Corporation data [28] confirm that DDT concentrations increase with depth only in the vicinity of the former surface impoundment.

At the depth interval 6-9.99 ft, concentrations of most target chemicals beyond the contoured locations fall below 100 ug/kg (ppb). In contrast, higher concentrations (order of magnitude or more) of several organic chemicals are observed at production pad and surface impoundment locations and at even greater depth intervals. The higher concentrations observed at these locations presumably reflect initially higher input concentrations. In the case of samples near the surface impoundment, deeper contaminant source locations and the presence of a significant liquid transport medium (liquids emanating from the pond) are indicated. DDT concentrations, for example, greater than 1,000,000 ug/kg (ppb) were observed at depths greater than 10 feet for both locations 14D and 24D, and are compared with values less than 40 ug/kg (ppb) at other locations at equivalent depths.

A similar trend was observed by Montrose's consultant [5], whose sampling of monitoring well MW2, a well constructed in the middle of the surface impoundment, revealed soil DDT concentrations greater than 1,000,000 ug/kg (ppb) at a depth of 77 feet (water table). In contrast, concentrations through equivalent depths, at non-surface impoundment locations, revealed soil DDT concentrations generally less than 600 ug/kg (ppb).

Inorganic Analytes Detected in Soils

Results of the inorganic analyses phase of the soil investigation are presented in Appendix E.

Trends in inorganic chemistry are not as apparent, relative to those described for soil organic chemistry. For the most part, this most likely results from the fact that with the exception of calcium, magnesium, and sodium, the distributions of the remaining inorganic species, though often variable, are believed to represent natural soil conditions [58].

The distribution of the major cations--calcium, magnesium, potassium and sodium--is presented in Appendix E. Concentration peaks, particularly for calcium and magnesium, are noted at profile locations associated with locations 12D, 13D, 14D, 15D, 22D, 34D and 35D. Patterns are similar to that observed previously for many of the organic target chemicals. Therefore it is reasonable to conclude that the distribution of these chemicals reflects man-made, rather than natural processes. However, the observed concentrations do not warrant inclusion of inorganic chemicals as chemicals of concern.

HYDROGEOLOGY

Five 2-in. diameter groundwater monitoring wells were installed by Montrose in April 1985. The wells were installed without approval of USEPA; however, it was determined that an approved groundwater sampling program using these wells would provide valid analytical data to enable a preliminary assessment of groundwater conditions at the site. Drilling of these wells was accomplished with a bucket auger to depths of 82 to 85 feet; well construction details and diagrams are presented in Appendix B, the wells were not developed after installation.

Groundwater was encountered in the Bellflower Aquitard at depths ranging from 69.25 ft at MW-1 to 74.67 ft at MW-2 based on measurements taken July 1-2, 1985. Twelve groundwater samples were taken from the monitoring wells during July and August 1985.

Groundwater Levels

Water level measurements were taken several times at the five onsite wells, and are summarized in Table 8. Groundwater contours have been used to establish the general direction of groundwater movement which is predominantly southeast in the eastern portion of the site and toward southwest in the western portion. Contour maps are presented in Figures 12 and 13.

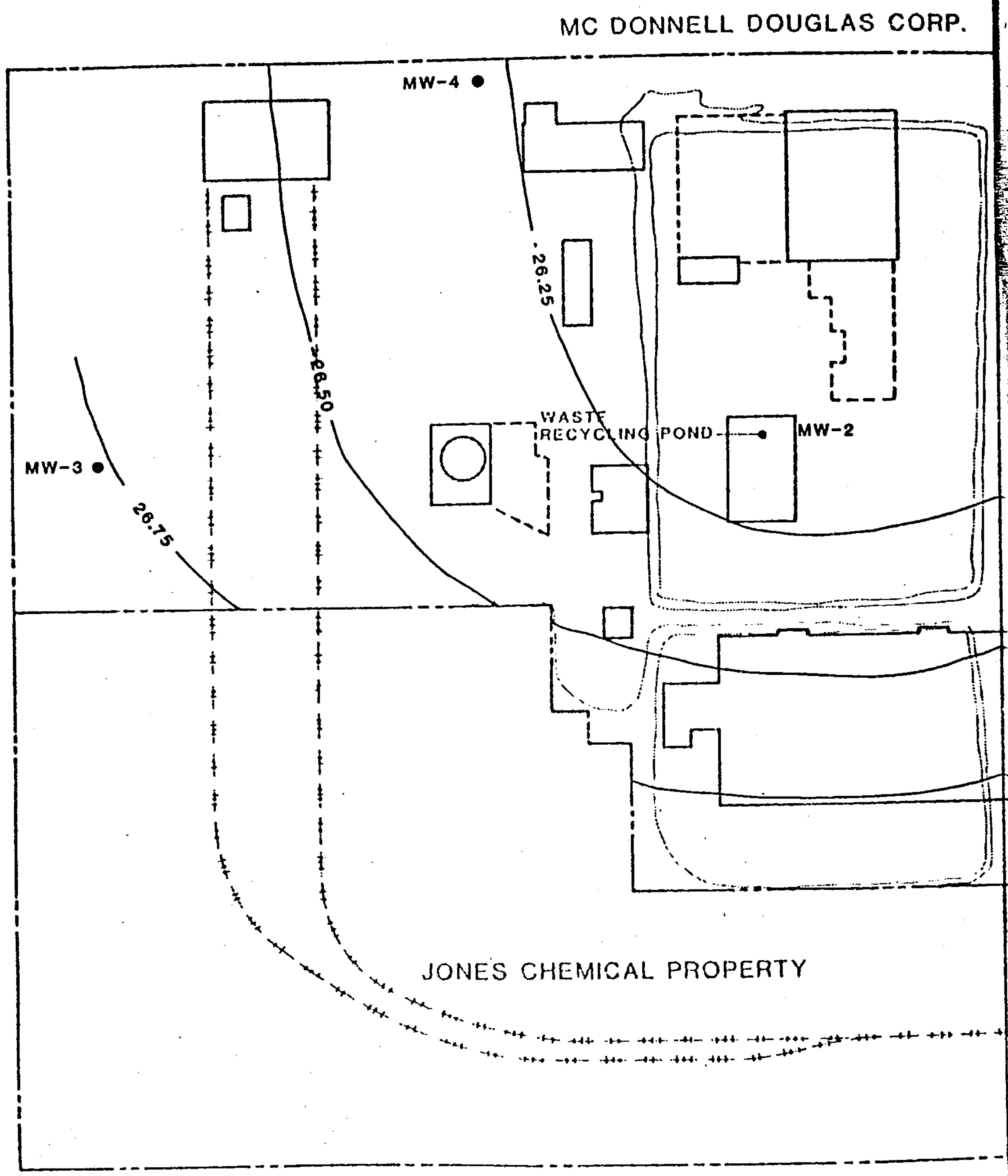
Table 8. GROUNDWATER LEVEL SUMMARY[a]

Well	Well (datum) elevation, ft	Total depth, ft	Total measured depth, ft[b]	Date	Depth to water, ft[c]	Water level elevation, ft[c]
MW-1	42.78	73.4	72.67	7/01/85	69.25	-26.47
				7/03/85	70.42	-27.64
				8/13/85	69.13	-26.35
				10/2/85	69.0	-26.22
				10/4/85	69.05	-26.28
				11/12/85	69.01	-26.24
				1/15/86	68.85	-26.08

Table 8. (Concluded)

Well	Well (datum) elevation, ft	Total depth, ft	Total measured depth, ft[b]	Date	Depth to water, ft[c]	Water level elevation, ft[c]
MW-2	48.74	76.6	77.0	7/02/85	74.67	-25.93
				7/03/85	74.75	-26.01
				8/13/85	74.40	-25.66
				10/2/85	74.33	-25.59
				10/4/85	74.27	-25.50
				11/12/85	74.29	-25.52
				1/15/86	74.13	-25.36
MW-3	47.65	74.5	74.5	7/02/85	73.75	-26.1
				7/03/85	74.42	-26.77
				8/13/85	73.49	-25.84
				10/2/85	73.29	-25.64
				10/4/85	73.34	-25.68
				11/12/85	73.40	-25.74
				1/15/86	73.32	-25.66
MW-4	47.08	75.5	75.58	7/02/85	72.95	-25.87
				7/03/85	73.17	-26.09
				8/13/85	72.67	-25.59
				10/2/85	72.54	-25.46
				10/4/85	72.69	-25.61
				11/12/85	72.70	-25.62
				1/15/86	72.55	-25.47
MW-5	45.15	72.6	72.5	7/02/85	71.85	-26.33
				7/03/85	71.50	-26.35
				8/13/85	71.19	-25.69
				10/6/85	71.08	-25.93
				10/4/85	71.02	-25.86
				11/12/85	71.08	-25.92
				1/15/86	70.84	-25.68
McDonnell-Douglas well (OW-1)	51[d]	(?)		7/08/85	106.83	-56
				8/14/85	109	-58
LAFCD well (OW-2)	25.1[d]	(165)		7/09/85	56.17	-31.07
				8/14/85	57.25	-32.15

a. Water level measurements of 10/4/85, 11/12/85, 1/15/86 taken by Montrose subcontractor, letter from Montrose to USEPA dated 2/4/86 [59].
b. Final (completed) depth of well measured in the field by USEPA field geologist.
c. Measurements taken on 7/3/85, 10/2/85, 10/6/85 were obtained by using steel tape. Measurements taken on 7/11/85, 7/2/85, 7/9/85, 7/8/85, 8/13/85, 8/14/85 were obtained by using electric tape, USEPA RI Part 1 conducted by Metcalf & Eddy, June-August 1984
d. Approximate elevation from USGS topographic map (Torrance Quadrangle).



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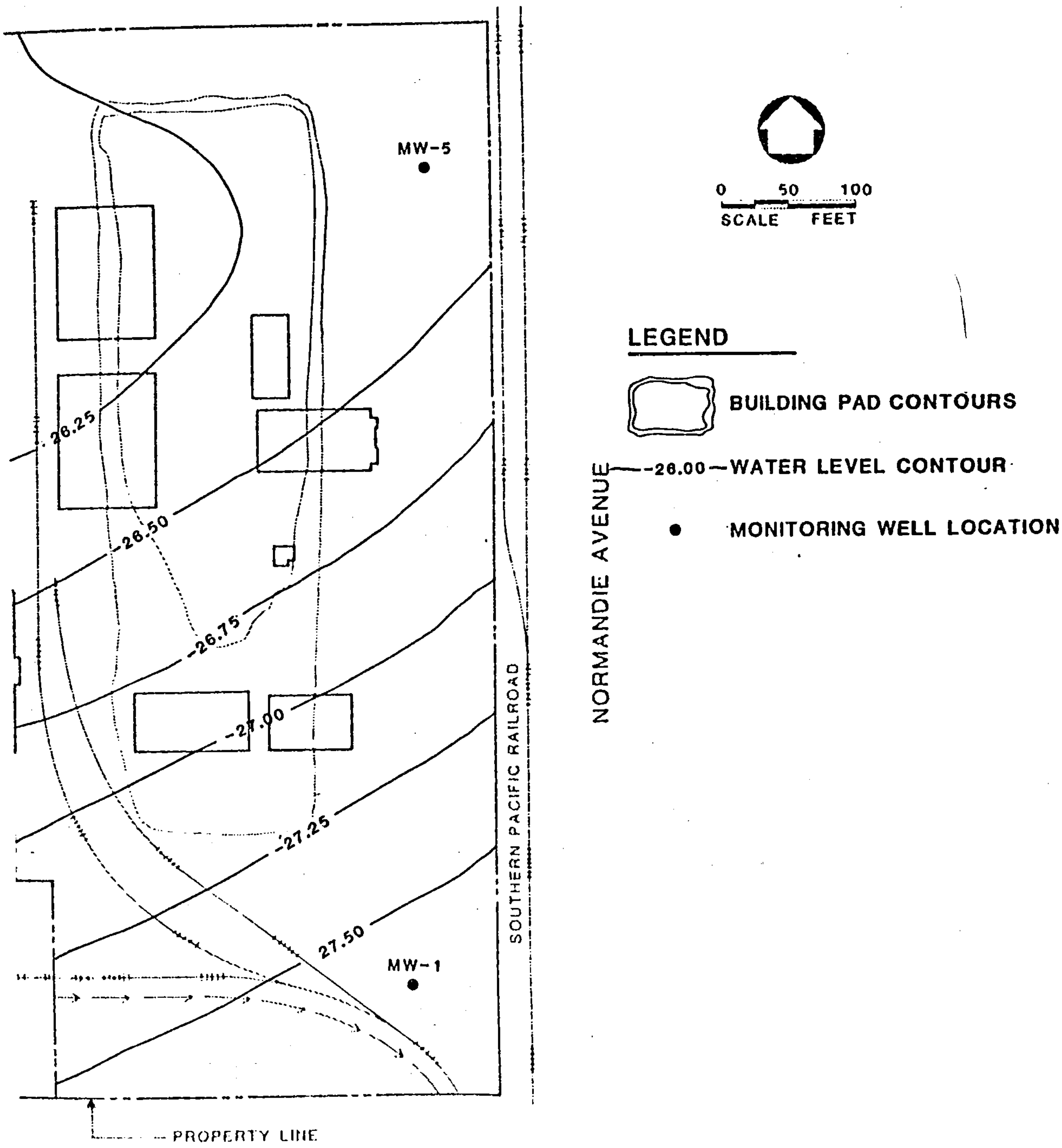
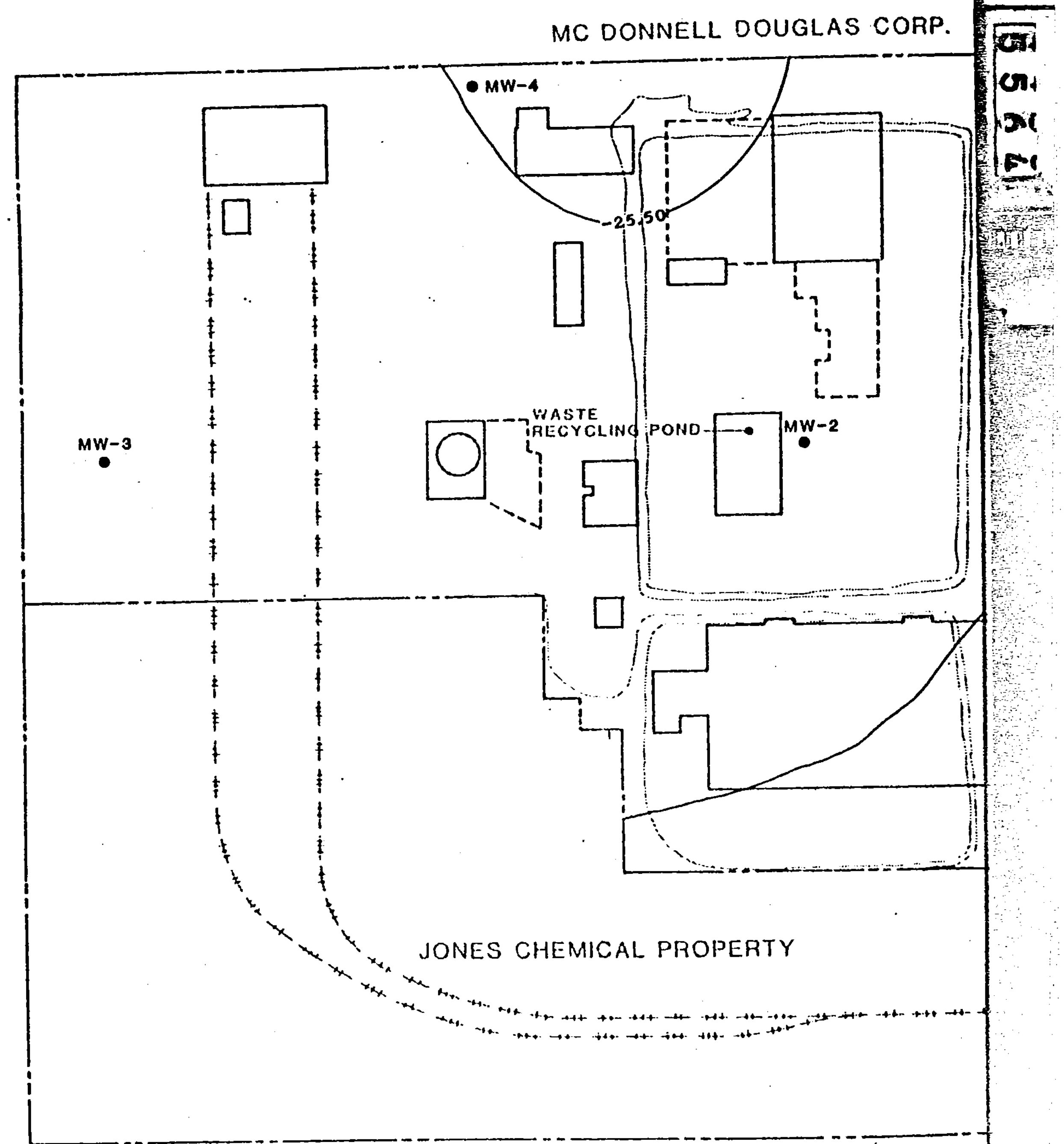


FIGURE 12
WATER LEVEL CONTOURS
(7-3-85)



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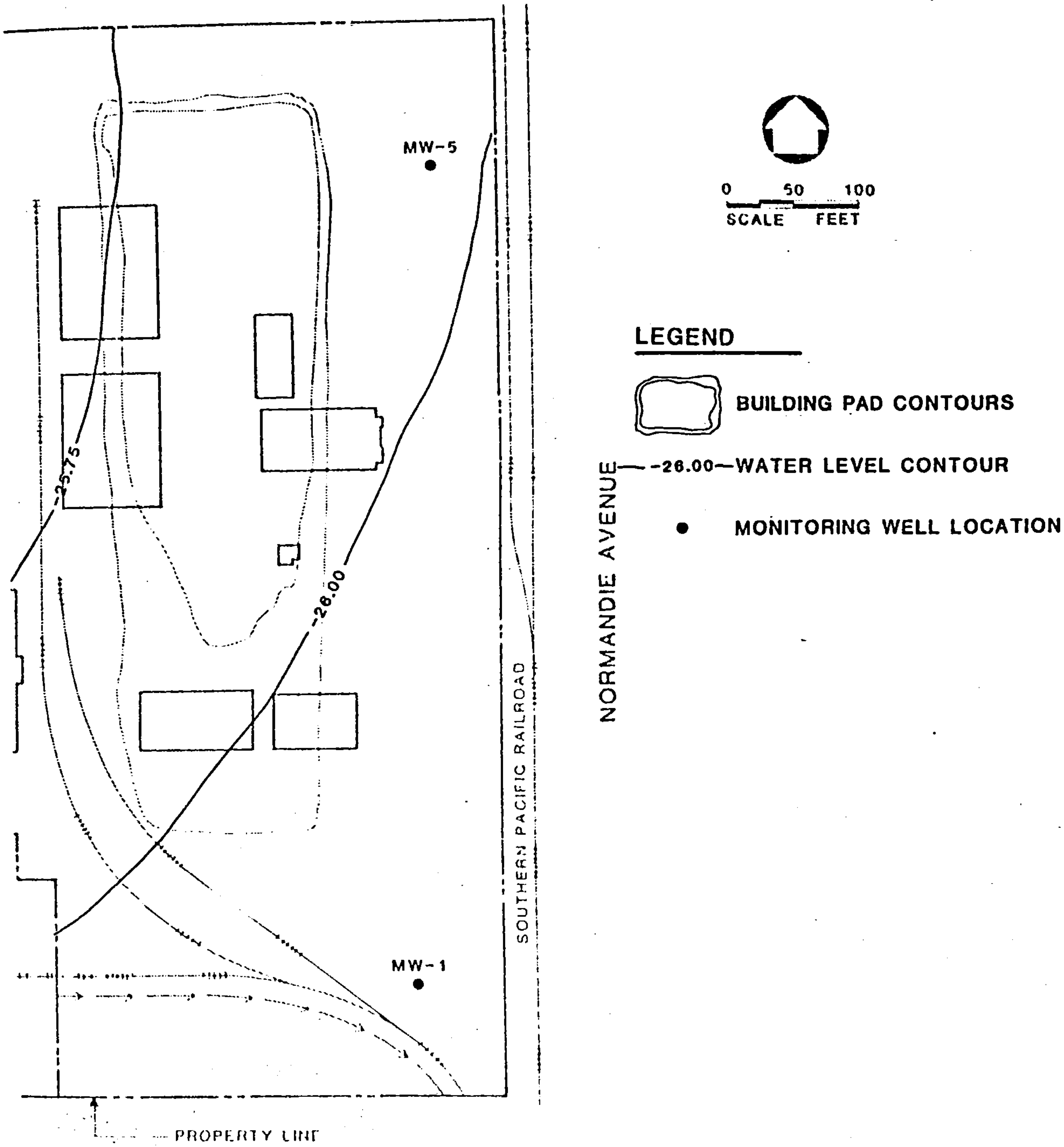


FIGURE 13
WATER LEVEL CONTOURS
(10-2-85)

Water level measurements taken during the RI Part 1 field investigation confirm that the groundwater gradient is very shallow beneath the site and slight fluctuations caused noticeable differences in both the direction of flow and gradient. The causes of these fluctuations are not known.

Local recharge historically has been from stormwater runoff and overflow of Dominguez Creek; however, since the channelization of the latter, overflow has been prevented leaving rainfall percolation as the primary source of recharge. An asphalt cover placed in March 1985 was designed to stop rainfall percolation; therefore no surface recharge is expected at the site provided the asphalt remains intact. Some minor recharge to the Montrose site may occur on unpaved properties close to the site.

Groundwater at the site is within a semiperched water body at depths below site of 76 feet (-26 to -27 feet mean sea level), which corresponds approximately with the top of the Bellflower Aquitard at elevation -25 feet (mean sea level). A review of local well logs and hydrologic literature indicates that the Gage Aquifer occurs at an elevation of about -100 feet (MSL), the Lynwood Aquifer at about -225 feet, and the Silverado Aquifer at -475 feet (MSL) [7, 12].

Lithologies shown on borehole logs from nearby wells (Del Amo site) indicate zones of low to moderate permeability within the Bellflower Aquitard. Pumping rates of 2 to 8 gpm during development of offsite monitoring wells provides supporting evidence of moderately permeable zones within the Bellflower [13]; similar conditions appear to exist at the Montrose site according to the sand zones described in Montrose's well logs [14]. These data suggest that both lateral and vertical movement of groundwater within the Bellflower Aquitard can occur.

A large water supply pumping center has been identified 2 to 3 miles southeast of the Montrose site in an area where the Lynwood and Silverado aquifers merge and the Gage Aquifer is in direct hydraulic continuity with them [15]. The potential for contamination of these merged aquifers is very significant particularly since a major groundwater pumping center is located within 3 miles of the Montrose site.

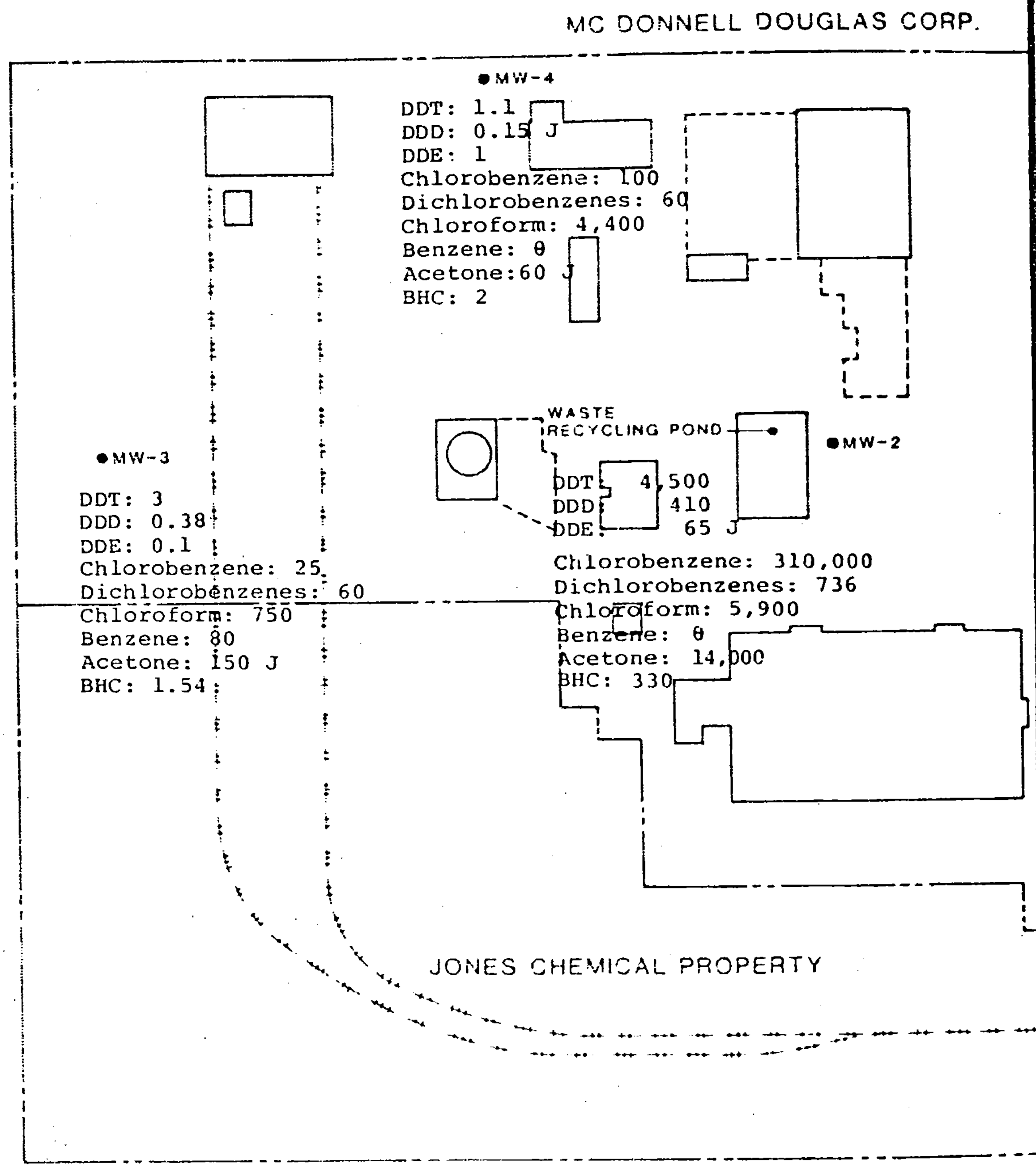
Chemicals Detected in Groundwater

Field observations indicate that high electrical conductivity readings and high organic vapor (HNu) readings for groundwater samples accompanied increased concentrations of chemical contaminants. The highest readings were measured at MW-2 and MW-4 which are close to the former surface impoundment. Groundwater samples retrieved using a PVC bailer caused failure of the vinyl flap valve due to chemical incompatibility. Subsequent samples taken (teflon bailer) showed distinct phase separation of non-water soluble solvents. This suggests that some contaminants, particularly those solubilized in certain solvents, may be transported as a separate phase on top of or immediately below the groundwater table.

Two mechanisms control the movement of chemicals in water; these are density and solubility (Table 4). In the case of solvents, they may sink, float, or flow with groundwater. A solvent that is denser than water and yet relatively insoluble in water, such as MCB, may sink through the water column until it reaches a relatively impermable layer where it will continue to move in the direction of slope of that impermeable layer. However, the effect of other chemicals and the overall environment are very specific factors affecting the rate of movement; for example, MCB is non-water soluble yet it can solubilize DDT. Other compounds are transported by solvents that are soluble in water; for example, chloroform and dichlorobenzenes are soluble in acetone and benzene. Depending on specific geologic and chemical conditions, these contaminants may move at a faster or slower rate than the groundwater itself. Determination of these factors is not within the scope of this report and must be determined in future investigations.

Figure 14 shows the distribution of chemicals of concern in groundwater. DDT, DDD, and DDE are found in all five wells with highest concentrations at MW-2 (4,500 ppb DDT, 410 ppb DDD, 65 ppb DDE). As discussed under Typical Properties of Known Chemicals, DDD and DDE are degradation products of DDT, DDD being the primary breakdown product. High concentrations of DDD and DDE in groundwater samples suggest that contaminant input has occurred over a long time period. MCB, acetone, and total dichlorobenzenes are also found in highest concentrations at MW-2. Based on known groundwater gradients and contaminant concentrations, these six compounds generally appear to be moving in an easterly to southeasterly direction consistent with the groundwater gradient.

Chloroform is found in highest concentration at MW-1, and benzene at MW-5 suggesting either an offsite source area or flushing or rapid movement of these solvents from a historical onsite source. The presence of alpha-, beta-, delta-, and gamma- (lindane) BHCs was detected in MW-1, MW-3, and MW-5 but was not detected at either offsite sampling location. The presence of these compounds cannot readily be explained by known site activities; however, lindane is a pesticide and may have been associated with Montrose's special products plant (Figure 2). Offsite wells sampled to provide background levels do not show DDT, DDD, DDE, chloroform, MCB, or total dichlorobenzenes at detectable concentrations; however, acetone was detected in OW-2. Offsite monitoring locations are shown in Figure A-2. OW-1 is used by McDonnell Douglas as an emergency water supply well for fire fighting, and OW-2 is used by LACFCD as a



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All data shown in ug/l (ppb)
J = For limited purposes only

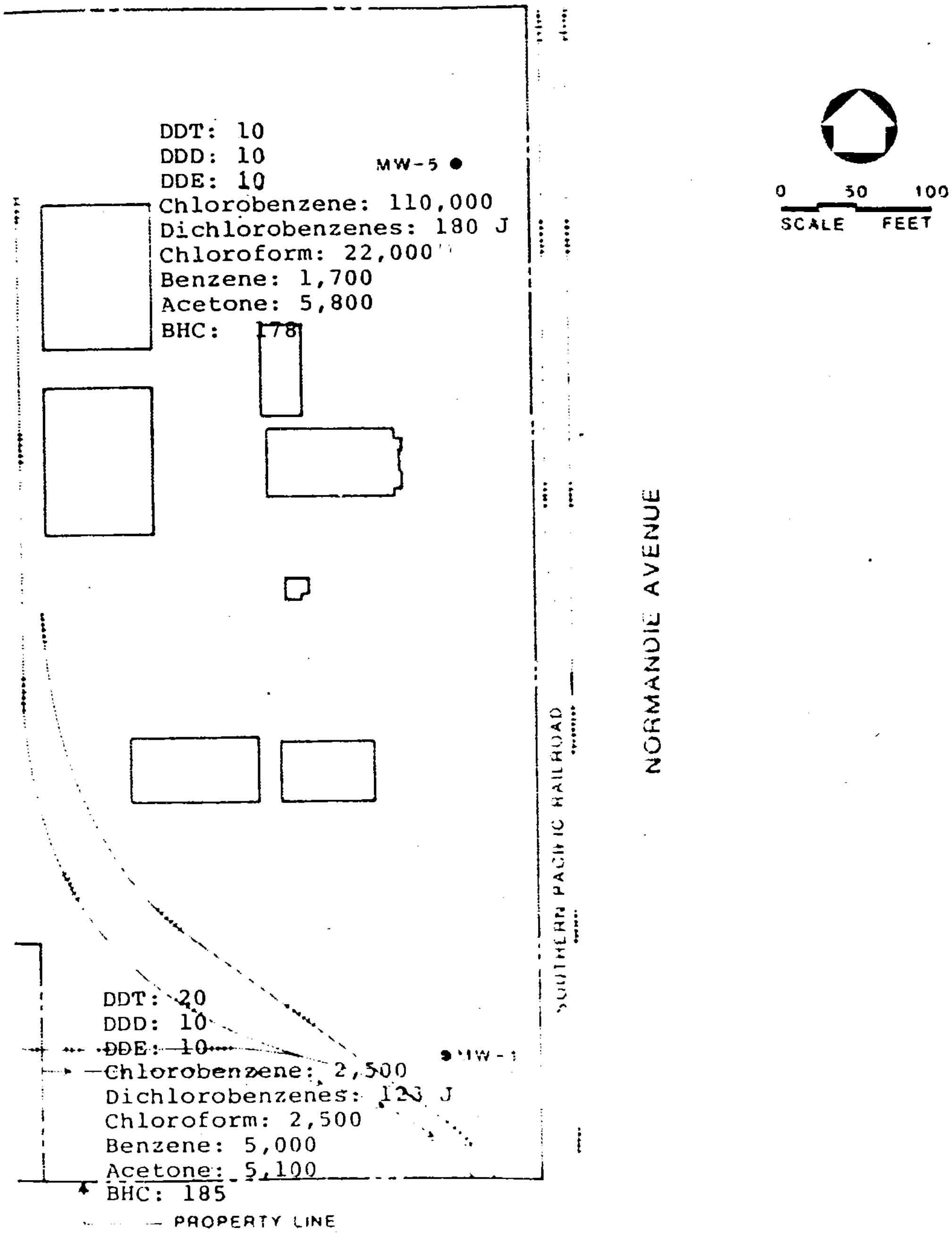


FIGURE 14
CHEMICAL CONCENTRATIONS
IN GROUNDWATER

piezometer to measure changes in water levels; neither of these wells is specifically designed for groundwater monitoring purposes.

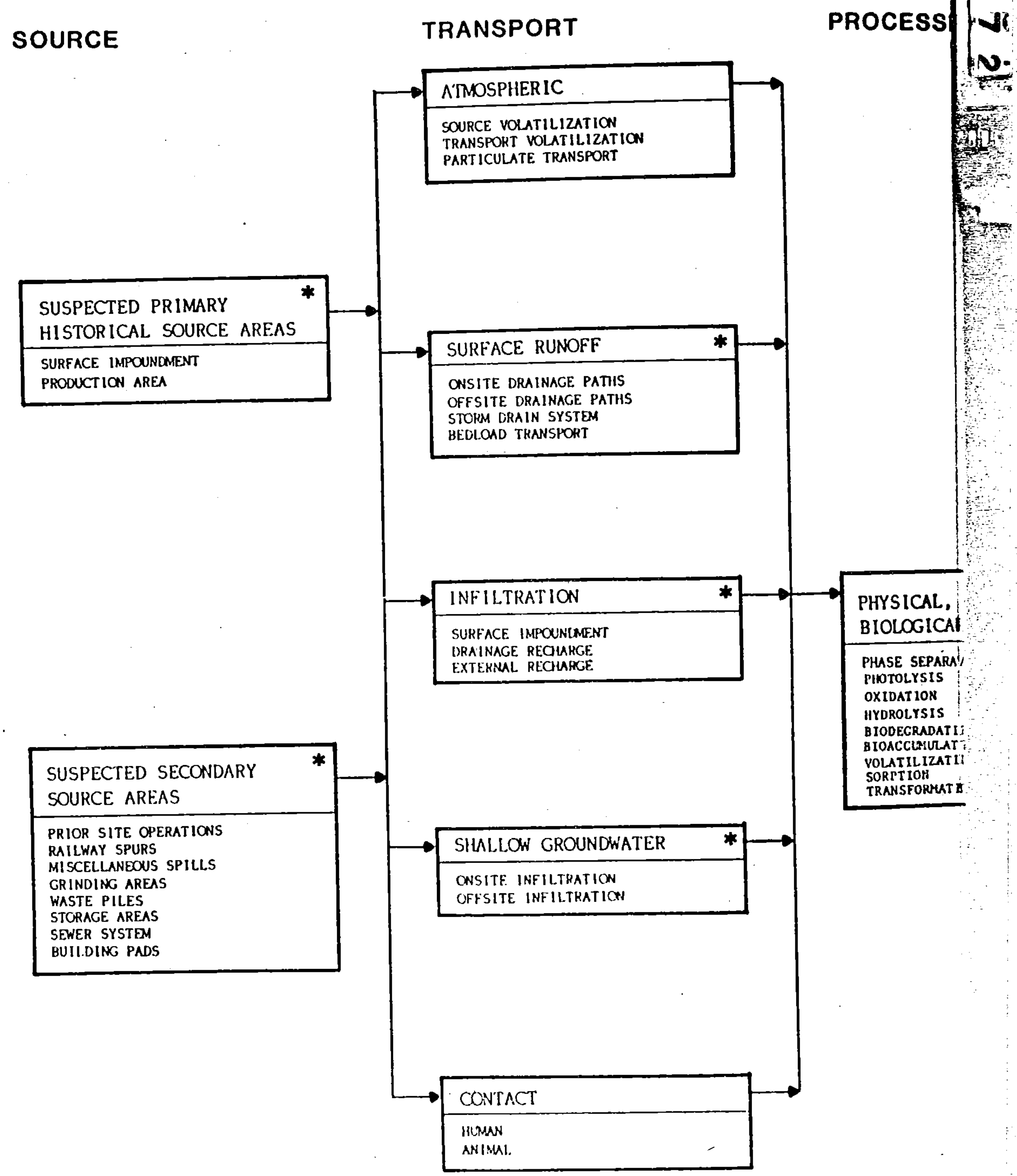
Chemical movement appears to be moving away from MW-2 and the surface impoundment; however, data based on five sampling points spread over a 13-acre site are insufficient to provide plume definition.

CHEMICAL TRANSPORT PATHWAYS

A number of physical, chemical and biological processes are known to be important in affecting the concentration of chemicals in soil and water environments. Although a detailed discussion of these processes is beyond the scope of this report, the processes that may be important in affecting the concentration of these chemicals in the the soil-water environment include those shown in Figure 5. Fate processes are very useful to understand the concepts of chemical movement in soil/water environments, and when reviewed with chemical and hydrogeologic data may be used to characterize site conditions.

Suspected source areas onsite include the surface impoundment (waste recycling pond) primary production and processing areas, as well as secondary sources including waste piles, storage areas, sanitary sewer, storm drains, grinding areas, and railway spurs (Figure 15). Analytical evidence confirms the entry of the above chemicals into the soil environment. Once released, onsite conditions appear to have favored transport via surface runoff, infiltration, shallow groundwater, and direct contact pathways, which may explain their current distribution in the environment.

Transport pathways to groundwater have included infiltration from surface water (i.e., drainage recharge), leakage from the former



* PATHWAYS DISCUSSED IN THIS REPORT

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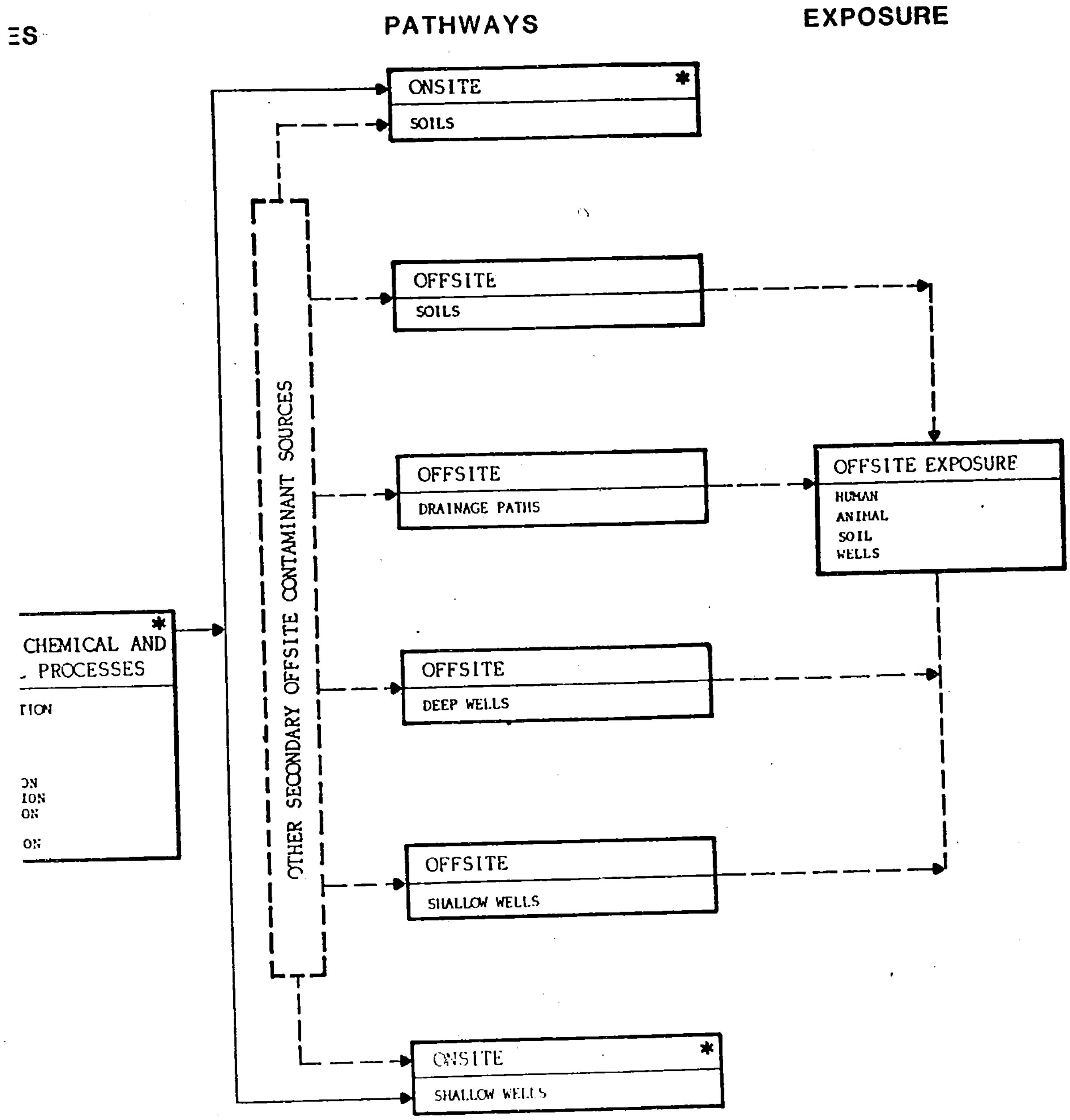

FIGURE 15
CONTAMINANT TRANSPORT PATHWAYS

surface impoundment, offsite recharge and infiltration from secondary source areas via movement through unsaturated (vadose) and saturated soils. Current contaminant inputs (after asphalt capping) from the surface are negligible; however, movement of contaminants from the surface impoundment in groundwater (and possibly soils) continues and in some cases contaminants may be transported to previously uncontaminated locations underground.

DDT is found in high concentrations uniformly across the site at shallow depths. At well MW-2 and nearby boreholes (14D and 24D), high concentrations of DDT extend to significant depths. The presence of DDT at locations peripheral to the former surface impoundment declines rapidly with depth in soils as indicated by sample results. Also, concentrations of DDT in groundwater samples from wells MW-1, MW-2, MW-3, and MW-4 are much lower than at MW-2. The data clearly indicate that a long-term source of DDT must have been available; since the former surface impoundment was not lined until 1970, this is the most obvious source.

DDT has a high affinity to organic soil fractions and in water adsorption would depend on the amount of suspended particulate available. Bioaccumulation is the most significant fate process for DDT in soil and groundwater environments and will be discussed in further detail in the Feasibility Study. The next most important fate process is volatilization, which is unlikely to be significant in anaerobic soil and groundwater environments. Indirect photolysis and hydrolysis may be important DDT fate processes in aquatic and soil environments; however, these processs are significantly affected by a range of variables. Oxidation of DDT is not expected to be an important fate process at the Montrose site. Indirect photolysis and hydrolysis may be important DDT fate processes in aquatic environments; however, these processes are significantly affected by a range of variables. Oxidation of DDT is not expected to be an important fate process at the Montrose site. Contaminant transport of DDD and DDE is considered similar to that of DDT. Degradation of DDT to DDD and DDE has been established but rates and conditions are not well documented.

MCB is detected in groundwater at all wells, and in high concentrations at MW-1 (2,500 ppb), MW-2 (310,000 ppb), and MW-5 (110,000 ppb). The latter two wells are located downgradient of a suspected historic MCB storage area; also, these three wells are situated in areas downgradient of the pond. Soil data confirm that MCB emanated from the pond area. Soil samples collected and analyzed by Montrose Chemical Corporation (April 1985) also confirm the pond as a source of MCB [28]. High MCB levels are also seen within the 6- to 13-foot interval at borehole 14D consistent with the historic storage area. In both cases, vertical transport of MCB by infiltration (percolation) and adsorption is obvious. MCB is insoluble in water but may have percolated under hydraulic head from the former pond as a separate solvent phase. At high concentrations, MCB may saturate soil adsorption sites and continue through the soil profile by infiltration.

Acetone is detected at several locations (14D, 15D, 24D, 35D) at concentrations of about 4,500 ppb in the 3 to 5 ft depth interval, and at 14D (9 to 9.5 ft) at 57,000 ppb. From the data, it appears that more than one onsite or offsite source seems likely to explain this widespread occurrence. Evidently this solvent has moved vertically through soil at a rate far exceeding its rapid volatilization; very concentrated input over a prolonged timeframe may have resulted in saturation of soil air spaces thus inhibiting volatilization. The presence of up to 14,000 ppb in groundwater (MW-2) may be explained by infiltration of acetone in a water matrix, probably due to extensive leakage from the surface impoundment.

DDT and MCB are both sparely soluble in water; however, both are soluble in acetone. Acetone is highly soluble in water and if present may enhance the distribution of DDT and MCB in soil and groundwater environments.

Chloroform in groundwater may originate from an unknown offsite source, yet an onsite source may also be indicated by high concentrations in soils at depths of up to 10 feet (borehole 14D, 9-9.5 ft, 72,000 ppb). It seems possible that chloroform may have been transported in groundwater under a different groundwater gradient from a source at or near borehole 14D. Concentration gradients from additional onsite wells may provide more definitive information.

Although benzene is found in high concentrations at MW-1 (5,000 ppb) and MW-5 (1,700 ppb), it is not detected in groundwater at MW-2 suggesting that the recycling pond was not a source area for this chemical or the plume has migrated. The only soil samples showing medium to low (500 to 8 ppb) levels are at borehole 35D. The absence of benzene in soils may be due to volatilization or flushing. The presence of benzene in groundwater may be explained by an offsite source but its presence at a depth of 9.5 feet of soil is more likely due to use and consequent infiltration near 35D.

The presence of dichlorobenzenes in all groundwater monitoring wells and in most soil borings with high concentrations in the upper 5 feet suggest multiple onsite sources. Greatest concentrations with depth in soil occur at boreholes 14D and 24D, and in groundwater at MW-2. Surface runoff could account for widespread shallow distribution, infiltration for deeper distribution. Grading operations may also account for widespread shallow distributions of dichlorobenzenes in soils. At location 24D, dichlorobenzenes show some affinity for silty sand and sandy silt materials which may have some relation to the very distinctive staining found at these depths.

In summary, the presence of DDT, DDD, DDE, MCB, dichlorobenzenes, and acetone in groundwater may be accounted for by infiltration from the former surface impoundment. Chloroform and benzene in groundwater indicate offsite sources; however, their presence in soils at depth suggests that onsite sources may also be significant. It is also possible that some chemical distributions can be explained by movement in groundwater and a variable groundwater gradient over time. Additional soil and groundwater data are needed to clarify these ideas.

CONCLUSIONS AND RECOMMENDATIONS

Groundwater and soils at the Montrose site have been contaminated with a number of chemicals, most of which were used in the manufacture of technical grade DDT. The distribution of contaminants in surface soils (0-10 ft) indicates more than one source of contaminant input from historical site activities. Lateral transport of contaminants in soils appears to be limited and the main transport process was by surface runoff. Regrading activities also caused lateral transport of shallow soils which were placed beneath current building pads. Vertical contamination is very extensive and is related to the former surface impoundment process areas and storage locations. The predominant vertical transport process appears to be infiltration of chemicals in either water or solvent-based matrix.

Groundwater contamination of the uppermost aquifer, the Bellflower Aquitard, indicates the possibility of more than one contaminant source, since some chemicals are found at significant concentrations upgradient of obvious source areas such as the wastewater pond. Field estimates of hydraulic conductivity suggest that percolation of contaminants to depths of at least 75 feet may have occurred over a long period of time at high input concentrations. Water level measurements in the Bellflower

Aquitard indicate a shallow groundwater gradient moving toward the southeast; slight fluctuations may cause the gradient to shift periodically. The Bellflower is considered to be a semiperched aquifer; a review of hydrologic literature indicates that it may "leak" into the underlying Gage Aquifer due to lowering of the hydraulic pressure head by groundwater pumping in the Gage.

In summary, the data show that onsite contaminant sources are the former surface impoundment (waste recycling pond), historical manufacturing and process areas (Figure 2), surface soils concentrated beneath present building pads, and two locations shown on aerial photographs as storage areas in quadrants 14D, 16D, 35D, and 36D.

Target Chemicals

Chemicals targeted for further investigation in Part 2 of the RI include the principal compounds used in the manufacture of DDT and a variety of solvents found at high concentrations onsite, including:

- DDT (all isomers)
- DDD (all isomers)
- DDE (all isomers)
- MCB
- Benzene
- Total dichlorobenzenes
- Acetone
- Chloroform
- BHC (all isomers)

These target chemicals may be split into five groups: DDT and isomers, benzene species, acetone, chloroform, and BHC isomers. Compounds were derived from comparisons of the highest concentrations of hazardous chemicals found in site soils and groundwater analyses.

Data Acquisition Needs

Data gathered during Part 1 of the Remedial Investigation are inadequate to fulfill the goals of the Feasibility Study. Additional field sampling and data analysis are required to substantiate suspected contaminant transport pathways and quantify site contamination.

The distribution of a number of chemicals cannot be fully explained on the basis of present data. Additional soil and groundwater data collection is required to describe chemical movement at the Montrose site. Specifically, it must be determined how and to what extent solvents are redistributing contaminants under both unsaturated and saturated conditions. Future sampling efforts should be directed toward verifying suspected contaminant transport pathways and to define, where possible, physiochemical boundaries of suspected contaminant plumes. These data will be used in the Feasibility Study to perform an endangerment assessment and to compare cleanup alternatives.

Future soil sampling efforts should concentrate on the following chemicals: DDT, DDD, DDE, MCB, dichlorobenzenes, acetone, chloroform, and BHC (all isomers). Methylene chloride and 2-butanone should also be included at this stage pending resolution of the laboratory contamination issue. Major cations including calcium, magnesium, and sodium should also be included for in groundwater analyses to distinguish different aquifers. Selected indicator parameters for soil and groundwater including pH, cation exchange capacity, electrical conductivity, and grain size should also be included. Additional deep soil sampling to depths of 60 feet should outline the behavior of a wetting front emanating from the surface impoundment. Boreholes placed at 20 to 30-ft concentric rings around the impoundment will define the shape of a wetting front both in distance and depth; this approach will also detect the presence of multiple plumes should they exist. Shallow soil borings (to depths of 25 feet) can be used to supplement information on areas impacted by surface operations and secondary source areas, e.g., railroad spurs.

Future groundwater sampling efforts should concentrate on the following chemicals: DDT, DDD, DDE, MCB, total dichlorobenzenes, chloroform, acetone, and benzene. Additional groundwater monitoring wells are warranted to determine the extent of contamination in the Bellflower Aquitard and to establish whether contamination has reached the underlying Gage Aquifer.

Additional wells and boreholes should be designed to verify current findings and identify the boundaries of individual plumes where possible. Rates of groundwater movement in the Bellflower Aquitard should be determined by either pumping tests or tracer tests, and if necessary, tracers may help identify differential movement of certain chemicals.

Groundwater analyses should include those compounds listed above as a minimum. Measurements of groundwater levels in the upper aquifer at additional wells and with regular frequency will enable a more precise determination of the groundwater gradient. It is recommended that at least three additional wells be installed in the Bellflower Aquitard, at locations that are downgradient to the former impoundment in quadrants 23D, 35A, 25A, and one upgradient at quadrant 13C. At least one well installed into the Gage Aquifer should be located in the vicinity of the impoundment; if contamination has reached this aquifer, then a more extensive program must be considered.

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APPENDIX A

FIELD INVESTIGATION PROCEDURES SUMMARY
(Including Soil and Groundwater Sampling Methodologies)

5585

REMEDIAL INVESTIGATION OF MONTROSE CHEMICAL CO.
PART 1
FIELD INVESTIGATION PROCEDURES SUMMARY

During the period June 18 to July 9, 1985, a series of air, soil, and groundwater quality measurements were made at both on- and off-site locations. This investigation was supplemented with a more limited groundwater investigation that took place during the period August 13-14, 1985. This second investigation involved resampling of five onsite and two offsite wells whose analytical results had been open to question because samples did not remain sufficiently cool during shipment. The following provides information on sample location and documents the methodology associated with these measurements.

METHODOLOGY

Air Quality and Onsite Safety

Organic vapor analyses were performed on a routine basis during round one of the soil and water sampling, using an HNu photo-ionizer with a 10.2 eV probe. The device was calibrated in an enclosed atmosphere, using a factory supplied 60 ppm benzene calibration gas. Span potential voltage was set as appropriate for direct ppm readout, generally increasing the sensitivity (and factor of safety) of the instrument, relative to that recommended by the manufacturer. The instrument was calibrated on a daily basis, and adjusted periodically throughout the day for electronic zero and recalibration as necessary. Field measurements were generally taken at down-well or down-borehole locations, since strong winds generally made above-hole measurements nonreproducible. Background measurements, both on- and off-site, were generally on the order of 0.7 ppm.

HNu measurements were used both as a relative field measure of volatile soil and groundwater contamination and provided a basis for establishing the type of personal protective clothing. During onsite drilling and groundwater sampling, HNu levels generally exceeded Health & Safety Plan action levels of greater than 5 ppm above backgound, and Level C personal protection was adopted on a routine basis. This level of protection included tyvek coveralls, latex rubber gloves, rubber boots, hard hats, eye goggles, and half-mask respirators equipped with GMC-H cartridges (for organic vapors up to 1,000 ppm and dusts with TWA less than 0.05 mg/m^3). A second leather or cloth glove was generally used during groundwater sampling to prevent ripping of the inner rubber glove. Leather gloves were discarded between sampling locations. Protective clothing was routinely changed between sampling sites to avoid cross-contamination. Final decontamination involved disposal onsite in 55-gal DOT approved drums.

SOIL SAMPLING

Onsite Soil Borings

Soil borings were drilled at the onsite locations indicated in Figure A-1. A total of 17 borings were completed to a total depth of 178.5 feet. Individual borings ranged from 9.5 to 19.5 feet, with the majority being 10 feet deep. In all cases, sampling was continuous throughout the indicated depth. A 140-lb hammer was used to advance the split spoon sampler ahead of and through an 8-in. hollow stem flight auger. The number of blows required to advance the sampler through 6-in. depth intervals was recorded and are shown on the boring logs. Three closely spaced brass liners, 6-in. long by 2-in. O.D. by 0.065-in. thick, were placed within standard split spoon samplers for sample retrieval. Auger flights were advanced only to the depth of the

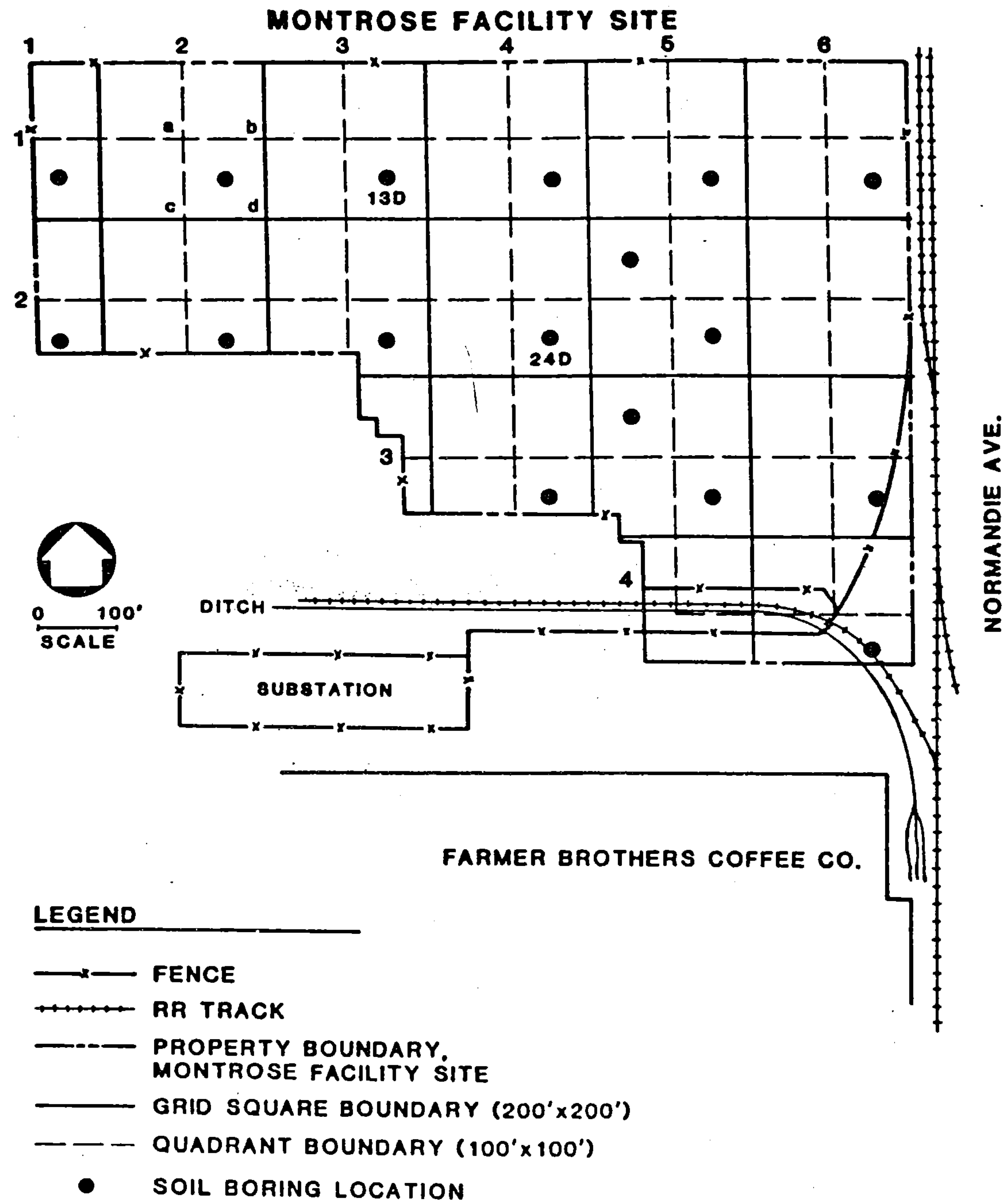

FIGURE A-1. SOIL BORING LOCATION

split spoon sampler. Drill cuttings were retrieved, separated according to depth (0-5 ft or >5 ft), and stored onsite in DOT approved 55-gal drums pending analyses and ultimate disposal directives. Boreholes were abandoned using a bentonite slurry consisting of a dense mixture of BENSEAL mixed with water and less than 5% by weight clean silica sand. All boreholes received a surface seal of portland cement.

Equipment decontamination procedures were consistent with those described previously in the Sampling Plan and Quality Assurance Plan. Prior to drilling, the drill rig and downhole flight augers were steam cleaned at the driller's yard. Additional steam cleaned auger flights were used as needed to lengthen the drill stem. All auger flights were steam cleaned at the end of each day for the following day's operations. Split spoon samplers and accompanying brass liners were initially washed in Alconox detergent, rinsed in deionized water, and final rinsed with pressurized steam. Brass liners were new, and were never reused. Split spoon samplers underwent an identical decontamination procedure, after each use. The entire drill rig was steam cleaned prior to leaving the site. All washwater was contained on site in DOT approved 55-gal drums pending sample analyses and ultimate disposal directives.

Upon retrieval, split spoon samplers were opened and the brass liners were separated. Brass liner contents (ends only) were described for lithology, color, and general appearance. The ends of each brass liner were then sealed with teflon caps and plastic caplugs, labeled, and readied for shipment as directed by Contract Laboratory Procedures. Samples were iced and sent Federal Express Priority One, overnight delivery to the appropriate contract laboratory for analysis.

Offsite Control Soil Samples

Two offsite locations were selected to obtain control (background) soil samples. The two locations were a new construction site close to the new Van Ness Business Center, one block west of Van Ness Avenue, and in the Caltrans right-of-way on the northeast corner of Normandie Avenue and Artesia Boulevard (Figure A-2). Samples were taken with a hand trowel decontaminated with rinses of Alconox, distilled water, hexane, acetone, and finally with certified organic free water. Descriptions of the soils profiles encoutered at both locations are included in Appendix B.

GROUNDWATER MONITORING WELLS

Existing groundwater wells were sampled at the five onsite wells (MW1-MW5), McDonnell-Douglas well (OW-1) and LAFCD well (OW-2). Construction details and well logs are provided in Appendix B.

Onsite Wells

Five onsite wells were installed by Hargis & Associates, Inc. during April 1985. They are 4-in. O.D., PVC plastic, and extend to a depth of approximately 70 to 75 feet below grade. These wells were perforated only through the lowermost 5 to 10 feet of casing.

Offsite wells are of steel construction. The McDonnell-Douglas well (OW-1) extends to a depth of 460 feet and is perforated at depths of 140 to 450 feet. The LAFCD well (OW-2) extends to a depth of 165 feet and was not perforated at all; the casing is open to groundwater only at the bottom, and can be described as a piezometer.

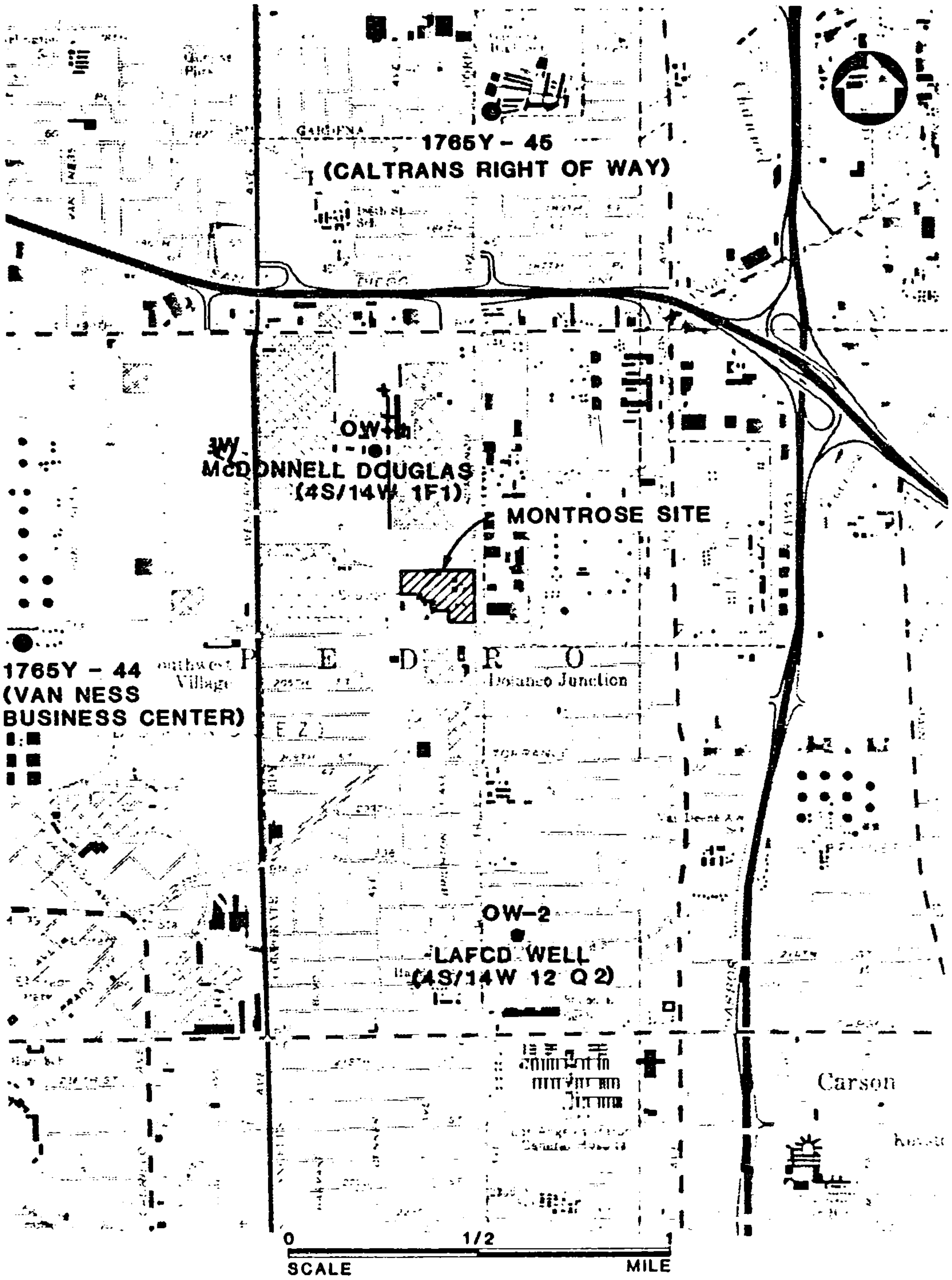

FIGURE A-2. OFFSITE CONTROL SOIL AND GROUNDWATER SAMPLES

Water levels were measured using a battery operated water level indicator, and when possible, checked against a weighted steel tape. Onsite well elevations had been previously surveyed by both Hargis & Associates and USEPA. Two existing onsite wells, MW-3 and MW-5, were dry and not sampled during the first round of sampling but were sampled successfully during the second round of sampling. Offsite well elevations were estimated using existing topographic and well log information.

Wells were either hand bailed or pumped as appropriate. Monitoring well 1 (MW-1) was initially bailed with a 2-in. O.D. by 2-ft PVC bailer, equipped with a vinyl rubber flap valve. The bailer was initially rinsed with Alconox detergent, followed by successive rinses with tap water, deionized water, and organic free water. A new nylon rope was used to lower the bailer down the well. Five casing volumes were bailed prior to sampling, with water being contained onsite in 55 gallon, DOT approved drums, pending ultimate disposal. Sample bottles were filled directly without the use of transfer vessels.

Use of a PVC bailer at MW-2 proved unsuccessful, since the vinyl flap valve curled upon exposure to groundwater and could not retain sample within the bailer. At MW-2 and MW-4, two new 4-in. by 2-ft teflon bailers, fitted with teflon ball valves, were used to retrieve onsite groundwater samples. Teflon bailers were cleaned the same way as PVC bailers. New, heavy-duty, nylon rope was used to lower each bailer down hole using a pulley-tripod. Five casing volumes were bailed prior to sampling, with water being contained onsite in 55-gal, DOT approved drums, pending ultimate disposal. Due to inadequate sample retention in the bailer during sample transfer, a thoroughly rinsed, 1 litre Nalgene beaker was used as a tranfer vessel between bailer and sample bottles.

During the second round of sampling, all onsite wells were sampled with a 4-in. by 2-ft teflon bailer (as above) decontaminated with successive rinses of Alconox detergent, tap water, distilled water, hexane, acetone, and final rinsed with certified organic free water. The bailer was lowered and retrieved as previously described, but only three casing volumes were bailed prior to sampling, with water being contained onsite in DOT approved, 55-gallon drums, pending ultimate disposal. One litre pyrex beakers were used as transfer vessels between bailer and sampling bottles. New transfer beakers were used at each well location and were rinsed three times with well water prior to filling with sample.

Offsite Well Sampling

The McDonnell-Douglas well (OW-1) was sampled using its existing pump. Being a large diameter well, it would have been impractical to purge five casing volumes and retain the purged volume onsite. Instead (with USEPA approval), an estimated one casing volume was discharged to an adjacent storm sewer prior to sampling. After purging, sample bottles were filled directly from a spigot located approximately 5 feet from the well head.

The Los Angeles Flood Control District well (OW-2) was sampled using a 3/4-hp Peabody-Barnes, 4-in. O.D. submersible pump. The pump was stainless steel and rated explosion-proof. The pump and attached 1.5-in. PVC hose was initially rinsed with 100 gallons of Alconox detergent, followed by over 200 gallons of tap water. A dilute solution of acetone-hexane (0.5 and 2 L, respectively, per 10 gallons of deionized water), and final rinse in organic free water was used prior to placing the pump down the well. The pump was initially lowered (using a new heavy duty nylon rope and pulley-tripod) to a depth of approximately 90 feet, but its initial pumping rate of approximately 4 gpm exceeded the well recovery rate and the water level soon fell below the level of the pump. The pump was lowered an additional 20 feet and restarted, with similar results. In addition, kinking of the discharge hose resulted in a leak, and the hose had to be replaced with a 5/8-in. vinyl rubber garden hose prior to lowering the pump to its final depth of 140 feet. After an estimated purging of one casing volume, sample bottles were filled directly without the use of transfer vessels. Soon after, water levels fell below the pumping level. Similar decontamination procedures were performed during the second round of sampling. However, the pump and vinyl rubber hosing were lowered directly to a depth of 111 feet. Sampling bottles were constantly filled, discharged, and filled throughout the sampling event until water level in the well fell below the level of the pump.

Samples were bottled and preserved in accordance with the Quality Assurance Plan and Contract Laboratory procedures, summarized in Tables A-1 and A-2. All bottles were precleaned and supplied by the EPA Contract Laboratory, I-Chem. Samples were packaged, iced, and shipped to the appropriate Contract Laboratory for sample analyses.

Field pH, temperature, and electrical conductivity measurements were routinely taken on grab samples throughout the sampling process. pH measurements were made using a Cole-Parmer, temperature compensating pH wand, calibrated against a pH 7.00 buffer. Temperature was measured using the same instrument and field-checked against a thermometer. Electrical conductivity measurements were made using a YSI, Model 33, temperature compensating, combination salinity-electrical conductivity meter. During the second round of sampling, the pH wand could not be satisfactorily calibrated and no measurements were made. Temperature measurements were made using the YSI conductivity meter, laboratory checked against a thermometer. Electrical conductivity measurements were made as described above.

Table A-1. SAMPLE BOTTLING AND PRESERVATION

Type of analysis	Container type, number of sample, quality control	Preservation and comments	No. of samples	No. of blanks	No. of duplicates	Minimum No. of bottles
RAS - volatile organics	2-40 mL glass vials fitted with teflon backed screw septum caps. Supplied by CL.	Vials filled completely with no head space. Iced for shipment, 4 deg C.	10	4	4	36
RAS - nonvolatile organics (extractables)	2-80 oz, amber glass bottles, with teflon liner caps. Supplied by CL.	Bottle filled 5/6 full, iced for shipment at 4 deg C.	10	4	4	36
RAS - inorganics, metals	1-1 L polyethylene bottle. Supplied by CL.	Bottle filled 7/8 full, acidified (1.5 mL conc. HNO_3/1 L) to $\leq$ pH2.	10	4	4	18
RAS - inorganics, cyanide	1-1 L polyethlene bottle. Supplied by CL.	Bottle filled 7/8 full. Add conc. NaOH to pH 12. Iced for shipment at 4 deg C.	10	4	4	18
SAS - chlorobenzene sulfonic acid	1-1 L amber glass bottle with teflon lined caps. Supplied by CL.	Bottle filled 5/6 full, iced for shipment at 4 deg C.	10	4	4	18
SAS - routine (TDS, chloride, sulfate, nitrate, nitrite, fluoride, calcium, carbonate, bicarbonate)	1-1 L polyethlene bottle with teflon lined cap. Supplied by CL.	Bottle filled 7/8 full, iced for shipment at 4 deg C.	10	4	4	18

Note: RAS = routine analytical service; SAS = special analytical service;
CL = contract laboratory.

Table A-2. CONTRACT LABORATORY ANALYTICAL PROCEDURES

Measurement parameter	Matrices	Method	Precision, relative standard deviation[a] %	Accuracy[b], %	Completeness, %
HSL compounds and library matches of 30 highest compounds	Low and medium concentration water and soil/sediment samples	CL RAS organic analysis	—As specified in— —CL contract— —quality control— —requirements—		95
Dioxin	Low concentration soil/ sediment samples	CL RAS organic analysis	—As specified in— —CL contract— —quality control— —requirements—		95
Metals and cyanide	Low concentration water and soil/sediment samples	CL RAS inorganic analysis	—As specified in— —CL contract— —quality control— —requirements—		95
Parachlorbenzene sulfonic acid	Low concentration water samples	CL SAS organic analysis, user provided[c]	<20	±20	75
Alkalinity	Low concentration water samples	CL SAS inorganic analysis (EPA 310.1)[d]	<5	±5	75
Residue, filterable	Low concentration water samples	CL SAS inorganic analysis (EPA 160.1)[d]	<15	±10	75
Chloride	Low concentration water samples	CL SAS inorganic analysis (EPA 325.3)[d]	<3	±3	75
Fluoride	Low concentration water samples	CL SAS inorganic analysis (EPA 340.2)[d]	<3	±5	75

Table A-2 (Concluded)

Measurement parameter	Matrices	Method	Precision, standard deviation[a] %	Accuracy[b], %	Completeness, %
Nitrogen, nitrate-nitrite	Low concentration water samples	CL SAS inorganic analysis (EPA 353.2)[d]	<12	±10	75
Sulfate	Low concentration water samples	CL SAS inorganic analysis (EPA 375.4)[d]	<10	±10	75
Carbon dioxide	Low concentration water samples	CL SAS inorganic analysis (Std.Methods, 406A)[e]	<10	±10	75
Total organic carbon	Low concentration soil/ sediment samples	CL SAS inorganic analysis (EPA 9060)[d]	<3	±5	75
Grain size	Low concentration soil/ sediment samples	CL SAS (ASTM D422)[f]	<20	±20	50
pH	Water samples	Determined in field (EPA 150.1)[d]	<1	±3	75
Temperature	Water samples	Determined in field (EPA 170.1)[d]	<1	±1	75
Electrical conductivity	Water samples	Determined in field	—	—	—

Note: RAS = routine analytical service; SAS = special analytical service; CL = contract laboratory.

a. For definition of precision, see Section 15.1.
b. For definition of accuracy, see Section 15.2.
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APPENDIX B

BOREHOLE LOGS AND
OFFSITE CONTROL SAMPLE LOGS

Table B-1. SOIL DESCRIPTION - NORTHEAST CORNER OF NORMANDIE AVENUE AND ARTESIA BOULEVARD, CALTRANS RIGHT-OF-WAY
June 24, 1985

Parent material:	Fill
Drainage:	Well drained
Aspect:	South facing slope
Stoniness:	Stony
Root distribution:	Weeds in upper horizon
Permeability:	Moderate to rapid
Comments:	In-place fill around light pole

0-20 in.	10 YR 5/4 (dry) yellowish brown, very gravelly sand-gravelly sand, with abundant stones greater than 2 in.; single grain--weak granular/subangular blocky; loose; gradual, wavy boundary.
20-33 in.	10 YR 6/3 (dry) pale brown, silty loam to loam; weak to moderate subangular blocky; soft to slightly hard, friable, non-sticky, non-plastic; gradual, wavy boundary.
33-43 in.	10 YR 5/6 (dry) yellowish brown, sand to gravelly sand; single grain to weak granular/subangular blocky; loose; gradual wavy boundary.
43-50 in.	10 YR 6/3 (dry) pale brown, silty loam to loam; weak to moderate subangular blocky; soft, friable, non-sticky, non-plastic; mottled with iron oxide and caliche.

Table B-2. SOIL DESCRIPTION - CONSTRUCTION SITE
ONE BLOCK WEST OF VAN NESS, AT NEW VAN NESS BUSINESS CENTER

Parent Material:	Fill over native soil
Drainage:	Poorly drained
Salt or alkali:	Caliche
Moisture:	Dry to slightly moist
Aspect:	North facing cut
Permeability;	Tight, low
Comments:	Upper fill from cut-and-fill operations; lower fill from construction debris

0-36 in.	2.5 Y 4/2 (dry) dark grayish brown, 5 Y 3/2 (moist) dark olive gray, sandy loam to clay loam; moderate to strong angular blocky; extremely hard, very friable to friable, sticky; clear, smooth boundary; with caliche (fill)
36-54 in.	10 YR 5/3 (dry) brown, 10 YR 5/6 (moist) yellowish brown, gravelly sand; single grain granular; loose; clear, smooth boundary; with caliche (fill)
54-68 in.	10 YR 5/2 (dry) grayish brown, 5 Y 3/1 (moist) very dark gray, clay; moderate, subangular blocky; extremely hard; diffuse, smooth boundary; with caliche, partial cementation.
68-95 in.	10 YR 6/2 (dry) light brownish gray, 10YR 6/4 (moist) light yellowish brown, clay loam with trace fine sand; single grain to weak subangular blocky; slightly hard, friable; diffuse, smooth boundary; with caliche, partial cementation.
95-113 in.	10 YR 5/4-5/6 (moist), yellowish brown, fine sandy clay loam-loam; weak, subangular blocky; soft, friable; occasional caliche.

BORING SUMMARY NO. 110

ELEVATION: N/I

DATE DRILLED: June 26, 1985

DEPTH IN FEET	SAMPLES	BLOW COUNT PER FOOT	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	RELATIVE COMPACTION %	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION				ADDITIONAL METCALF & EDDY COMMENTS
							Asphalt concrete base				
1–3	C&B	14, 19, 13, 5, 8					Fill: clayey silt matrix, fine, with gravel and crushed brick	medium firm	moist	dark brown	CALICHE, CONCRETE
3–5	C&B C&B	9, 4, 8, 21				ML-CL	Clayey silt, fine, with occasional lenses of fine sandy silt	firm			GREY HUES
5–7.5	C&B	4, 14, 22, 6, 10				SM-ML	Silty sand, fine, with clay, oxide and trace of caliche	medium dense		brown	WELL DRAINED IRON OXIDES, MANGANESE OXIDE (7)
7.5–9	C&B	16, 6, 9				SM	Silty sand, fine to medium, with clay and trace of oxide inclusions			light brown	
9–9.5	C&B	12					Silty clay, fine, trace of fine sand		slightly moist		

TOTAL BORING DEPTH 9.5 FEET
NO GROUNDWATER ENCOUNTERED
TIME: SETUP 7:00 a.m.
START 7:05 a.m.
STOP 7:45 a.m.

C&B - Nominal 2-inch California modified

Subcontract No. 1-625-299-222-001, Montrose Chemical Company
Torrance, California
for CCA Corporation

EXHIBIT NUMBER 1

Pioneer Drilling Co.

JOB NUMBER: 356-001

Approved For Report On ____________ By ____________

BORING SUMMARY NO. 12D

ELEVATION: N/I

DATE DRILLED: June 25, 1985

Depth in Feet	Samples	Blow Count per Foot	Field Moisture % Dry Weight	Dry Density Lb./Cu. Ft.	Relative Compaction %	Unified Soil Classification	Material Description				Additional Metcalf & Eddy Comments
0–1							Asphalt concrete base				
1–3	C&B C&B	7 5 5 4 5 5					Fill: clayey silt matrix, fine, with trace of fine to coarse, with gravel and crushed brick	firm	moist	dark brown	CONCRETE, OCCASIONAL DARK GREEN STAINS
3–5	C&B	4 6 8				CL-ML	Clayey silt, fine, with trace of fine sand with caliche	firm			DARK REDDISH-BROWN HUES
5–5.5		7					Small lense of red-stained matrix				
5.5–7	C&B	8 9 3				SH-ML	Silty sand, fine, with oxide inclusions	medium dense	-	light brown	IRON OXIDE, MANGANESE OXIDE (?)
7–9.5	C&B C&B	4 6 7 8 11				CL-ML	Clayey silt, fine, with fine sand and caliche	stiff			

TOTAL BORING DEPTH 9.5 FEET
NO GROUNDWATER ENCOUNTERED
TIME: SETUP 3:45 p.m.
START 3:50 p.m.
STOP 4:15 p.m.

C&B - Nominal 2-inch California modified

Subcontract No. 1-625-299-222-001, Montrose Chemical Company
Torrance, California
for CCA Corporation

EXHIBIT NUMBER 2

Pioneer Drilling Co. JOB NUMBER: 356-001

Approved For Report On ______ By ______

BORING SUMMARY NO. 130

ELEVATION: N/I

DATE DRILLED: June 25, 1985

DEPTH IN FEET	SAMPLES	BLOW COUNT PER FOOT	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	RELATIVE COMPACTION %	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION				ADDITIONAL METCALF & EDDY COMMENTS
0–1							Asphalt concrete base, fine to coarse	medium dense	dry	gray	
1–5	C&B (2), C&B (3), C&B (5)	13, 17, 17, 7, 16, 18, 11, 11, 6				ML-CL	Fill: sandy clayey silt, matrix, with trace fine to coarse, with gravel and crushed brick Gravel increasing	firm	moist	dark brown	CONCRETE AND INCREASING CLAY WITH DEPTH, GREYISH HUES, IRON OXIDE
5–8	C&B (6), C&B (8)	5, 6, 8, 4, 6, 8				ML-SM	Sandy clayey silt, fine, with caliche and trace of oxide inclusions			dark brown to brown	PARTIAL CEMENTATION WITH INCREASING DEPTH
8–9.5	C&B (9.5)	5, 6, 10				CL-ML	Clayey silt, fine, with trace of fine sand with inclusions of caliche in the form of gravel	stiff		light brown	

TOTAL BORING DEPTH 9.5 FEET
NO GROUNDWATER ENCOUNTERED
TIME: SETUP 3:00 p.m.
START 3:05 p.m.
STOP 3:35 p.m.

Depth scale: 1–25 feet

C&B - Nominal 2-inch California modified

Subcontract No. 1-625-299-222-001, Montrose Chemical Company
Torrance, California
for CCA Corporation

EXHIBIT NUMBER 3

Pioneer Drilling Co.

JOB NUMBER: 356-001

Approved For Report On ________ By ________

BORING SUMMARY NO. 140

ELEVATION: N/I

DATE DRILLED: June 19, 1985

Depth in Feet	Samples	Blow Count per Foot	Field Moisture % Dry Weight	Dry Density Lb./Cu. Ft.	Relative Compaction %	Unified Soil Classification	Material Description				Additional Metcalf & Eddy Comments
							Asphalt concrete base				
1–6	C&B C&B C&B	7 9 12 6 10 18 8 12 14				ML-CL	Fill: clayey silt to silty, clay, fine, with inclusions of gravel, brick and wood	firm to stiff	moist	dark brown	RED STAINED, INCREASINGLY MOTTLED WITH DEPTH, GREY HUES
6–8	C&B C&B	7 15 23 8 16 24				CL-ML	Silty clay, fine, with trace of caliche and gypsum	stiff			INCREASINGLY COARSE WITH DEPTH CONTACT NOTED AT 7 FT
8–13.5	C&B C&B C&B	8 14 16 10 11 13 8 12 15				SM-ML	Sandy silt, fine, with caliche and trace of clay Note: Missed interval due to adding additional sample depth after pulling out Slightly fine			brown to light brown	

TOTAL BORING DEPTH 13.5 FEET
NO GROUNDWATER ENCOUNTERED
TIME: SETUP 4:30 p.m.
START 4:35 p.m.
STOP 5:15 p.m.

C&B - Nominal 2-inch California modified

Subcontract No. 1-625-299-222-001, Montrose Chemical Company
Torrance, California
for CCA Corporation

EXHIBIT NUMBER 4

Pioneer Drilling Co. JOB NUMBER: 356-001

Approved For Report On ______ By ______

BORING SUMMARY NO. 15D

ELEVATION: N/I DATE DRILLED: June 19, 1985

DEPTH IN FEET	SAMPLES	BLOW COUNT PER FOOT	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	RELATIVE COMPACTION %	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION				ADDITIONAL METCALF & EDDY COMMENTS
0–1							Asphalt concrete base (0.7 inches), fine to coarse	medium dense	dry	gray	
1–5.5	C&B (2), C&B (3), C&B (5)	7, 11, 17, 30, 30, 32, 6, 14, 14				CL-SM	Fill: clayey silt to silty, clay matrix, fine, with coarse, with gravel, concrete and reddish stained caliche	firm	moist	dark brown	RED AND WHITE STAINS, GREYISH HUES
5.5–8	C&B (6), C&B (8)	5, 14, 21, 8, 16, 29				CL-ML	Silty clay, fine, with trace of caliche	stiff			INCREASING CALICHE WITH DEPTH IRON OXIDE
8–9.5	C&B (9.5)	13, 29, 44				ML-SM	Clayey silt, fine, with trace of fine sand, caliche and fine sandy silt			brown	CONTACT BETWEEN MONTEZUMA CLAY AND RAMONA SAND (?)

TOTAL BORING DEPTH 9.5 FEET
NO GROUNDWATER ENCOUNTERED
TIME: SETUP 2:30 p.m.
START 2:35 p.m.
STOP 3:15 p.m.

C&B - Nominal 2-inch California modified

Subcontract No. 1-625-299-222-001, Montrose Chemical Company
Torrance, California
for GCA Corporation

EXHIBIT NUMBER 5

Pioneer Drilling Co. JOB NUMBER: 356-001

Approved For Report On ________ By ________

BORING SUMMARY NO. 160

ELEVATION: N/I DATE DRILLED: June 19, 1985

DEPTH IN FEET	SAMPLES	BLOW COUNT PER FOOT	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	RELATIVE COMPACTION %	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION				ADDITIONAL METCALF & EDDY COMMENTS
							Asphalt concrete base				
1 2 3	C&B C&B	15 13 19 7 13 20				CL-ML	Silty clay, fine, with trace of fine sand (No sample retained. Pushed road base with sampler into underlying material.)	medium firm	moist	dark brown	FILL WITH CONCRETE AND BRICK YELLOW, RED, WHITE STAINS
4 5 6 7	C&B C&B	10 19 36 17 37 50				ML	Sandy clayey silt, fine, with trace of caliche Caliche increasing	firm to stiff stiff		brown	MOTTLED RED STAINS
8 9	C&B C&B	16 30 43 13 18 21				SM	Silty sand, fine, with trace of clay trace of medium sand	medium dense	slightly moist	brown to light brown	WELL DRAINED WITH MANGANESE OXIDE CONCRETIONS
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25							TOTAL BORING DEPTH 9.5 FEET NO GROUNDWATER ENCOUNTERED TIME: SETUP 7:30 a.m. START 7:55 a.m. STOP 2:15 p.m.				

C&B - Nominal 2-inch California modified

Subcontract No. 1-625-299-222-001, Montrose Chemical Company
Torrance, California
for CCA Corporation

EXHIBIT NUMBER 6

Pioneer Drilling Co. JOB NUMBER: 356-001

Approved For Report On ________ By ________

BORING SUMMARY NO. 210

ELEVATION: N/A

DATE DRILLED: June 26, 1985

DEPTH IN FEET	SAMPLES	BLOW COUNT PER FOOT	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	RELATIVE COMPACTION %	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION				ADDITIONAL METCALF & EDDY COMMENTS
							Asphalt concrete base				
1–2	C&B	16 6 6 3					Fill: clayey silt, fine, with gravel and a white salt precipitate	medium firm	moist	brown	NO SPLIT SPOON RECOVERY
3–4	C&B	7 11 7 11				ML-CL	Clayey silt, fine, with fine sand and trace of caliche	firm			MOTTLED DARK GREYISH HUES
5–6	C&B C&B	17 8 9 11				SM-ML	Silty sand, fine to medium, with caliche in pods	medium dense			IRON OXIDE
							Clay lens				
7–9	C&B C&B	6 16 12 6 10 16				SM-ML	Sandy silt, fine, with clay Increasing clay to clayey silt with fine sand	stiff			GREYISH HUES

TOTAL BORING DEPTH 9.5 FEET
NO GROUNDWATER ENCOUNTERED
TIME: SETUP 8:00 a.m.
START 8:05 a.m.
STOP 8:40 a.m.

C&B - Nominal 2-inch California modified

Approved For Report On ________ By ________

Subcontract No. 1-625-299-222-001, Montrose Chemical Company
Torrance, California
for CCA Corporation

EXHIBIT NUMBER 7

Pioneer Drilling Co.

JOB NUMBER: 356-001

BORING SUMMARY NO. 22D

ELEVATION: N/I

DATE DRILLED: June 26, 1985

Depth in Feet	Samples	Blow Count per Foot	Field Moisture % Dry Weight	Dry Density Lb./Cu. Ft.	Relative Compaction %	Unified Soil Classification	Material Description				Additional Metcalf & Eddy Comments
							Asphalt concrete base				
1–2	C&B	16 8 9					Fill: clayey silt, fine, with fine to coarse and gravel	medium dense	moist	dark brown	DARK GREYISH HUES WHITE CRYSTALS PRESENT
2–3	C&B	4 9 12				CL-ML	Clayey silt, fine, with trace of fine sand	firm			DARK GREYISH HUES, CALICHE, IRON OXIDE
4–5	C&B	4 10 16				SM-ML	Sandy silt, fine, with clay and caliche			brown	WELL DRAINED, LIGHT GREYISH HUES
5–7	C&B	5 8 9 6 8					Silty sand, fine to medium, with clay	medium dense		brown to light brown	WITH IRON OXIDE, LIGHT GREY TO GREENISH HUES
8–9	C&B C&B	10 2 8 10				ML-CL	Clayey silt, fine, with fine sand and caliche	stiff		light brown	

TOTAL BORING DEPTH 9.5 FEET
NO GROUNDWATER ENCOUNTERED
TIME: SETUP 8:50 a.m.
START 9:00 a.m.
STOP 9:45 a.m.

C&B - Nominal 2-inch California modified

Approved For Report On ______ By ______

Subcontract No. 1-625-299-222-001, Montrose Chemical Company
Torrance, California
for CCA Corporation

EXHIBIT NUMBER 8

Pioneer Drilling Co.

JOB NUMBER: 356-001

BORING SUMMARY NO. 230

ELEVATION: N/I

DATE DRILLED: June 25, 1985

DEPTH IN FEET	SAMPLES	BLOW COUNT PER FOOT	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	RELATIVE COMPACTION %	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION				ADDITIONAL METCALF & EDDY COMMENTS
							Asphalt concrete base				
1–3	C&B	13, 8, 12, 5, 11				ML-CL	Fill: clayey silt, fine, with fine sandy silt	firm	moist	dark brown	WITH DARK GREENISH HUES, CONCRETE, IRON OXIDE, MANGANESE OXIDE (?), CALICHE
3–4	C&B	16, 5, 14				SM-ML	Sandy silt to silty sand, fine			brown	IRON OXIDE AND CALICHE
4–7	C&B, C&B	17, 5, 7, 8, 6, 12					Silty sand, fine, with trace oxide inclusions and caliche matrix			brown to light brown	GREENISH HUES
7–9.5	C&B, C&B	15, 8, 11, 11				ML-CL	Sandy silt, fine, with clay to clayey silt, trace sand	stiff		brown	GREENISH MOTTLING, IRON AND MANGANESE OXIDES

TOTAL BORING DEPTH 9.5 FEET
NO GROUNDWATER ENCOUNTERED
TIME: SETUP 2:10 p.m.
START 2:15 p.m.
STOP 2:50 p.m.

C&B - Nominal 2-inch California modified

Subcontract No. 1-625-299-222-001, Montrose Chemical Company
Torrance, California
for GCA Corporation

EXHIBIT NUMBER 9

Pioneer Drilling Co.

JOB NUMBER: 356-001

Approved For Report On ______ By ______

BORING SUMMARY NO. 24D

ELEVATION: N/I DATE DRILLED: June 25, 1985

DEPTH IN FEET	SAMPLES	BLOW COUNT PER FOOT	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	RELATIVE COMPACTION %	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION				ADDITIONAL METCALF & EDDY COMMENTS
0–1							Asphalt concrete base, fine to coarse	medium dense	dry	gray	
1–6	C&B (2) C&B (3) C&B (5)	11 11 14 7 7 14 5 12 9 3 10				SM-ML	Fill: clayey silt, fine, fine, with bricks, gravel and sand	firm	moist	dark brown	DARK GREY HUFS, GREEN & WHITE STAINS
6–9.5	C&B (6) C&B (8) C&B (9)	12 3 5 6 4 7 10				ML-CL	Clayey silt, fine, with fine sand, trace of caliche, with occasional fine to medium sand lenses				SAMPLE SHOE SHOWS PURPLE STAIN
9.5–15.5	C&B (11) C&B (12) C&B (14)	6 5 10* 12 16 19 6 12 16 18** 6 5				SM-ML	Silty sand, fine, with trace of clay, purple material included very moist hard cemented lenses of purple sandstone. (Retainer placed in sampler; still lost sample.) No sample No sample	medium dense		brown	PURPLE SHEEN, GRAB SAMPLE OF DRILL CUTTINGS
15.5–20	C&B (16) C&B (18) C&B (19)	9 14 11 35 32 9 18 24				ML	Sandy silt, fine, with silty clay lenses and patches of purple material Decreasing purple residue	stiff	slightly moist	light brown	MOTTLING WITH IRON OXIDE, GREENISH HUES
20–25							TOTAL BORING DEPTH 19.5 FEET NO GROUNDWATER ENCOUNTERED TIME: SETUP 11:40 a.m. START 11:45 a.m. STOP 1:25 p.m.				

C&B - Nominal 2-inch California modified * Lost sample
** Sample only retained in lower tube. The sampler may have penetrated material; not retaining materials due to hard material lodged in sampler.

Subcontract No. 1-625-299-222-001, Montrose Chemical Company
Torrance, California
for CCA Corporation

EXHIBIT NUMBER 10

Pioneer Drilling Co. JOB NUMBER: 356-001

Approved For Report On ______ By ______

BORING SUMMARY NO. 25A

ELEVATION: N/I   DATE DRILLED: June 19, 1985

Depth in Feet	Samples	Blow Count per Foot	Field Moisture % Dry Weight	Dry Density Lb./Cu. Ft.	Relative Compaction %	Unified Soil Classification	Material Description				Additional Metcalf & Eddy Comments
0–0.7							Asphalt concrete base, fine to coarse (0.7 ft.)	medium dense	dry	gray	
1–5	C&B (2)	9, 7, 8				CL-ML	Fill: Silty clay with trace of gravel at top, trace of caliche	firm	moist	dark brown	END OF FILL
	C&B (3)	5, 11, 17					Increasing caliche to approximately 10%				DARK BROWN SILTY CLAY WITH CALICHE, IRON OXIDE
	C&B (5)	6, 10, 13									
5–9	C&B (6)	10, 19, 23				SM-ML	Sandy silt, fine, with clay and caliche	firm to stiff		brown	WELL DRAINED
						SM-ML	Silty sand, fine	medium dense		brown to light brown	
	C&B (8)	8, 15, 18									
9–9.5	C&B (9)	7, 12, 14				ML	Sandy silt, fine, with trace of clay	stiff		light brown	

TOTAL BORING DEPTH 9.5 FEET
NO GROUNDWATER ENCOUNTERED
TIME: SETUP 3:30 p.m.
START 3:35 p.m.
STOP 4:15 p.m.

C&B - Nominal 2-inch California modified

Approved For Report On ________ By ________

Subcontract No. 1-625-299-222-001, Montrose Chemical Company
Torrance, California
for CCA Corporation

EXHIBIT NUMBER 11

Pioneer Drilling Co.   JOB NUMBER: 356-001

BORING SUMMARY NO. 250

ELEVATION: N/I   DATE DRILLED: June 18, 1985

DEPTH IN FEET	SAMPLES	BLOW COUNT PER FOOT	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	RELATIVE COMPACTION %	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION				ADDITIONAL METCALF & EDDY COMMENTS
0–0.7							Asphalt concrete base, fine to coarse	medium dense	dry	gray	
0.7–7	C&B C&B C&B C&B	6 13 16 16 18 26 9 20 23 10 21 19 8					Fill: clayey silt matrix, fine, with coarse and inclusions of red brick, gravel, trace of sand with red / staining on soil, maybe brick dust	firm	moist	dark brown brown	RED, YELLOW, WHITE STAINS
7–9	C&B C&B	14 23 12 15 27				ML-CL	Original ground Clayey silt, fine, with fine sand	stiff			CALICHE
9–11	C&B	9 21 24				SM	Silty sand, fine, with trace of clay and gravel Silty sand, fine to medium	medium dense		light brown	

TOTAL BORING DEPTH 11.0 FEET
NO GROUNDWATER ENCOUNTERED

Depth scale: 1–25 feet

C&B - Nominal 2-inch California modified

Approved For Report On ______ By ______

Subcontract No. 1-625-299-222-001, Montrose Chemical Company
Torrance, California
for CCA Corporation

EXHIBIT NUMBER 12

Pioneer Drilling Co.   JOB NUMBER: 356-001

BORING SUMMARY NO. 34Da

ELEVATION: N/I

DATE DRILLED: June 25, 1985

DEPTH IN FEET	SAMPLES	BLOW COUNT PER FOOT	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	RELATIVE COMPACTION %	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION				ADDITIONAL METCALF &EDDY COMMENTS
0–0.5							Asphalt concrete base, fine to coarse	medium dense	dry	grey	
0.5–6.3	C&B, C&B, C&B, C&B	10, 9, 6, 6, 12, 13, 6, 7, 6, 4, 6, 7				ML-CL	Fill: clayey silt matrix, fine, with gravel, bricks and trace of sand Note: No sample; first hole terminated at 4.5 ft. due to concrete slab; moved 10 ft. south and drilled to 5 ft. to being sampling.	firm	moist	dark brown	GREYISH HUES, SOME STAINING CLEAR (COLORLESS) CRYSTALS IRON OXIDE
6.3–8	C&B	4, 6, 7				ML-CL	Clayey silt, fine, with caliche and iron oxide	stiff			IRON AND MANGANESE OXIDES
8–9		9, 10				ML-SM	Sandy silt, fine, with clay				
9–9.5	C&B	12					Silty sand, fine, with black oxides or precipitates in material			light brown	

TOTAL BORING DEPTH 9.5 FEET
NO GROUNDWATER ENCOUNTERED
TIME: SETUP 10:25 a.m.
START 10:30 a.m.
STOP 11:25 a.m.

C&B - Nominal 2-inch California modified

Subcontract No. 1-625-299-222-001, Montrose Chemical Company
Torrance, California
for GCA Corporation

EXHIBIT NUMBER 13

Pioneer Drilling Co. | JOB NUMBER: 356-001

Approved For Report On ________ By ________

BORING SUMMARY NO. 35A

ELEVATION: N/I

DATE DRILLED: June 25, 1985

DEPTH IN FEET	SAMPLES	BLOW COUNT PER FOOT	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	RELATIVE COMPACTION %	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION				ADDITIONAL METCALF & EDDY COMMENTS
0–0.7							Asphalt concrete base, fine to coarse (0.7 ft.)	medium dense	dry	gray	
0.7–3	C&B	15 7 5 3 6					Fill: Silty sand, fine to coarse, with red brick and gravel	loose	moist	dark brown	GREYISH HUES, CALICHE
3–5	C&B C&B	7 5 5 5				ML-CL	Clayey silt, fine, with trace of fine sand and caliche	firm			
5–9	C&B C&B	5 4 7 5 10 15 4 9				SM-ML	Sandy silt, fine, with clay and trace of caliche Slight increase in fine sand and caliche	stiff		brown	IRON OXIDE
9–9.5	C&B	10				ML-CL	Clayey sandy silt, fine, with iron oxide			brown to light brown	

TOTAL BORING DEPTH 9.5 FEET
NO GROUNDWATER ENCOUNTERED
TIME: SETUP 8:30 a.m.
START 8:35 a.m.
STOP 9:20 a.m.

C&B - Nominal 2-inch California modified

Subcontract No. 1-625-299-222-001, Montrose Chemical Company
Torrance, California
For CCA Corporation

EXHIBIT NUMBER 14

Pioneer Drilling Co.

JOB NUMBER: 356-001

Approved For Report On ________ By ________

BORING SUMMARY NO. 35D

ELEVATION: N/I

DATE DRILLED: June 18, 1985

DEPTH IN FEET	SAMPLES	BLOW COUNT PER FOOT	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	RELATIVE COMPACTION %	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION				ADDITIONAL METCALF & EDDY COMMENTS
0–1		11					Asphalt concrete base, fine to coarse	medium dense	dry	gray	
1–6.5	C&B C&B C&B C&B	7 11 5 11 16 9 11 19 5 8 10				ML	Fill: clayey silt with inclusions of concrete and gravel with inclusions of red brick and concrete	firm	moist	dark brown	BASE OF FILLS AT 4FT (?)
6.5–8	C&B	8 13 17				CL-ML	Original ground, silty clay, fine	stiff			CALICHE, IRON OXIDE WELL DRAINED
8–9		12 16				ML-CL	Clayey silt, fine, with trace of fine sand			brown	WELL DRAINED
9–9.5	C&B	23					Silty sand, fine, with trace of clay				

TOTAL BORING DEPTH 9.5 FEET
NO GROUNDWATER ENCOUNTERED
TIME: SETUP 2:00 p.m.
START 2:05 p.m.
STOP 3:30 p.m.

C&B - Nominal 2-inch California modified

Subcontract No. 1-625-299-222-001, Montrose Chemical Company
Torrance, California
for CCA Corporation

EXHIBIT NUMBER 15

Pioneer Drilling Co. JOB NUMBER: 356-001

Approved For Report On ________ By ________

BORING SUMMARY NO. 360

ELEVATION: N/I

DATE DRILLED: June 19, 1985

DEPTH IN FEET	SAMPLES	BLOW COUNT PER FOOT	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	RELATIVE COMPACTION %	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION				ADDITIONAL METCALF & EDDY COMMENTS
							Asphalt concrete base, fine to coarse (0.7 ft.)	medium	dry	gray	
1–2	C&B	23 9 7				CL	Fill: Silty clay with trace of fine sand, inclusions of road base may be fill 2-3 ft.	medium firm	moist	dark brown	DARK GREY HUES, WHITE PARTICLE' BASE OF FILL AT 3.5 FT (?)
3	C&B	8 7 10									
4–5	C&B	6 9 13									
5–6	C&B	7 14 17				SM-ML	Sandy silt, fine, with trace of clay and organics, with white-gray inclusions	stiff	slightly moist	brown	MOTTLED CALICHE, OCCASIONAL STAINS
7–8	C&B	7 12 17				SM	Silty sand, fine to medium, with trace of clay and organics	medium dense			OCCASIONAL STAINS, GREENISH HUES
9	C&B	8 10 13									
10–25							TOTAL BORING DEPTH 9.5 FEET NO GROUNDWATER ENCOUNTERED TIME: SETUP 1:00 p.m. START 1:05 p.m. STOP 1:45 p.m.				

C&B - Nominal 2-inch California modified

Subcontract No. 1-625-299-222-001, Montrose Chemical Company
Torrance, California
for CCA Corporation

EXHIBIT NUMBER 16

Pioneer Drilling Co. | JOB NUMBER: 356-001

Approved For Report On ______ By ______

BORING SUMMARY NO. 460

ELEVATION: N/I

DATE DRILLED: June 18, 1985

DEPTH IN FEET	SAMPLES	BLOW COUNT PER FOOT	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	RELATIVE COMPACTION %	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION				ADDITIONAL METCALF & EDDY COMMENTS
0–0.5							Asphalt concrete base, fine to coarse	medium dense	dry	gray	
0.5–6	C&B C&B C&B	20 10 12 8 8 11 5 7 10 11 10				CL-ML	Silty clay with gravel, numerous hair roots, and white inclusions decreasing with depth	medium firm	moist	dark brown	DARK GREYISH HUES BASE OF FILL AT 3.5FT (?)
6–7	C&B	13 7				SM-ML	Sandy silt, fine, with trace of roots	stiff		brown	WELL DRAINED
7–10	C&B C&B	13 17 7 10 13 11				SM	Silty sand, fine, with trace of clay (Sampler was not loaded; material placed into tubes.)				
10–11	C&B	15 21				ML	Clayey sandy silt, fine				MOTTLING
11							TOTAL BORING DEPTH 11.0 FEET NO GROUNDWATER ENCOUNTERED TIME: SETUP 10:30 a.m. START 11:00 a.m. STOP 12:45 p.m.				

Depth scale: 1–25

C&B - Nominal 2-inch California modified

Subcontract No. 1-625-299-222-001, Montrose Chemical Company
Torrance, California
for CCA Corporation

EXHIBIT NUMBER 17

Pioneer Drilling Co. JOB NUMBER: 356-001

Approved For Report On ______ By ______

APPENDIX C

WELL LOGS

Offsite Well Logs
Hargis & Associates Well Logs
Construction of Onsite Monitoring Wells

4S/14W-1F3
Sowce LACFCD

✓

LOG OF WELL NO. 794C

FROM	TO	CLASSIFICATION OF MATERIALS	FROM	TO	CLASSIFICATION OF
0	3	Top soil			
3	68	Clay			
68	118	Sandy clay-soft streaks			
118	122	Fine brown sand			
122	134	Brown sandy clay			
134	153	Blue clay-streaks of sand			
153	187	Fine blue sand			
187	214	Blue sandy clay			
214	316	Blue clay			
316	324	Blue clay-¼" embedded gravel			
324	330	Blue clay			
330	333	Blue clay-¼" embedded gravel			
333	418	Blue clay			
418	424	Fine muddy sand, some ¼" to ½" gravel			
424	432	Fine sand to 3/8" gravel			
432	437	Fine sand and clay			
437	460	Blue sandy clay			
460	470	Fine sand and clay			
470	474	Blue clay			
474	482	Sand and gravel to 1"			
482	495	Sand and gravel to 3/4"			
495	515	Sand and gravel to 2"			
515	519	Sand and gravel to ½", muddy			
519	536	Fine sand and clay			
536	547	Sand and gravel to 1"			
547	573	Fine sandy clay			
573	600	Blue clay			

Perforations 427-433, 478-516, 538-550

Struck water at

Water level before perf. after perf. 83

Remarks DATA FROM DWR JAN 59

4S/14W-12 Q 2

78W340 106 REV. [illegible] SHEET 1

LOS ANGELES COUNTY
FLOOD CONTROL DISTRICT
HYDRAULIC DIVISION
WELL DATA

Owner: L.A.C.F.C.D. 0.3± mile No. of Carson St.

Location and Description: 600±E. of Normandie Ave.; 50'± No. of 212 St. Storm Drain produced
637'E. of ℄ Normandie Ave;
42.2' N. of ℄ proposed LACFCD easement & R/W; 3-26-59
27' E.-S.E. of F.C. monument

Use: G.W. Observation

Elev. of average grd. at well: ~~18~~ 25.1 U.S.G.S. Datum

Elev. of grd. adjacent to well: U.S.G.S. Datum

Water surface reference points:

(a) From 10-1-56 To Elev. 20.5 How det. topo.
Description: Top of capped casing, 2.5' above grd.

(b) From 4-17-59 To Elev. 20.5 How det. Rel. to RP a)
Description: 1/2" slot in side of extended well casing (same level as RP a)). (Casing extend 11.45' topped with hinged lid.)

(c) From 10-1-59 To Elev. 27.88 How det. Rel. to RP a) & b)
Description: Top of casing with hinged lid. 2.78' above grd.

(d) From 9-14-61 To 9-21-76 Elev. 24.4' How det. L.A.Co. Eng. Map File # 290-F62
Description: Top of 8" casing, 0.7 ft. below top of ground & top of dirt roadway

*(e)

Type of well: Cable Tool Size 8"

Original depth: 165' Soundings: 1595 11-10-59 171'-11-9-59

Pumping equipment: None

Power used:

Capacity: Drawdown:

Date drilled: 10-1-56 By Peck & Son

Artesian characteristics:

Quality of water:

Remarks: RP(e) 9-20-61 elev. 25.6' rel. to RP(d)
Top of 8" casing extended 1.2 ft above RP(d).
0.5 ft above ground.
*~~R.P. e Top of~~

(over)

Well Numbers: 5620
NC 1
D.W.R.
D.W.R.
F.C. 806C

DTW 56.25 ft 6/27/85 [illegible]

C-2

BOE-C6-0177970

LOG OF WELL NO. 806 C

FROM	TO	CLASSIFICATION OF MATERIALS
0	11	Clay: dark gray with brown spots max. 1/2"; firm caliche nodules to 1/2", hard scattered straw filaments.
11	15	Sandy clayey silt; brown; 20% medium grained well sorted loose sand.
15	19	Silty clay; olive-brown with rust brown streaks about 3/4" long; firm, friable when dry.
19	53	Clayey silt, some fine sand, mottled tan and gray, some mica at 42'; few decomposed shells.
53	56	Very silty fine sand; tan; loose; 30% gravel 1/4"-2"; 10% fragments of shells; considerable mica (biotite).
56	60	Gravel; clean, 1/8"-1/2"; moderately well sorted; 10% shell fragments.
60	62	Large gravel made up of cemented shells. Pebble size to 3". Pitted.
62	64	Very silty fine sand, tan; 30%± 1/4" to 1"; loose. Biotite present.
64	66	Cemented shells 1/2" to 3" pebbles. Pitted. 5% silt and fine sand.
66	68	Sand, fine to medium, some silt; pieces of cemented sandstone; shells.
68	72	Gravel made of 1/2" pieces of cemented sand; shell fragments.
72	88	Medium to coarse sand, some fine 20%± 1/4" cemented sand aggregations, numerous sand size shell fragments. At 81' only few sand aggregations, at 86' color change to gray.
88	96	Sand, fine to medium, 10%± coarse, medium olive gray, shell fragments.
96	99	Clayey silt grading to silty clay, olive with minute orange streaks, some embedded shells.
99	106	Clay, dark greenish gray, few sand stringers, few shells.
106	112	Silt, sandy, clayey, firm, dark greenish gray; numerous shells.
112	118	Clayey silts and silty sands, interbedded, gray; fossils.
118	125	Sand and silt, very fine, gray, probably friable.
125	132	Sand, very fine, loose, gray; much biotite mica.
132	142	Sand, fine to medium, loose, well sorted, much mica, few shell frags, gray.
142	158	Sand, fine, loose, much mica, gray.
158	164	Sand and silt, fine, loose, gray; with carbon matter.
164	165	Sand, medium, gray, with many shells and pieces.

Perforations: Not perforated

Struck water at 56'

Water level before perf. ______ after perf. ______

Remarks ______

(over)

806C

LOG OF WELL NO. 806 C

FROM	TO	CLASSIFICATION OF MATERIALS
0	11	Clay: dark gray with brown spots max. 1/16"; firm caliche nodules to 1/2", hard scattered straw filaments.
11	15	Sandy clayey silt; brown; 20% medium grained well sorted loose sand
15	19	Silty clay; olive-brown with rust brown streaks about 1/4" long; firm, friable when dry.
19	53	Clayey silt, some fine sand, mottled tan and gray, some mica at 42'; few decomposed shells.
53	56	Very silty fine sand; tan; loose; 30% gravel 1/4"-2"; 10% fragments of shells; considerable mica (biotite).
56	60	Gravel; clean, 1/8"-1/2"; moderately well sorted; 10% shell fragments.
60	62	Large gravel made up of cemented shells. Pebble size to 3". Pitted.
62	64	Very silty fine sand, tan; 30%± 1/4" to 1 1/2; loose. Biotite present.
64	66	Cemented shells 1/4" to 3" pebbles. Pitted. 5% silt and fine sand.
66	68	Sand, fine to medium, some silt; pieces of cemented sandstone; shells.
68	72	Gravel made of 1/4" pieces of cemented sand; shell fragments.
72	88	Medium to coarse sand, some fine 20%± 1/4" cemented sand aggregations, numerous sand size shell fragments. At 81' only few sand aggregations, at 86' color change to gray.
88	96	Sand, fine to medium, 10%± coarse, medium olive gray, shell fragment.
96	99	Clayey silt grading to silty clay, olive with minute orange streaks, some embedded shells.
99	106	Clay, dark greenish gray, few sand stringers, few shells.
106	112	Silt, sandy, clayey, firm, dark greenish gray; numerous shells.
112	118	Clayey silts and silty sands interbedded, gray; fossils.
118	125	Sand and silt, very fine, gray, probably friable.
125	132	Sand, very fine, loose, gray, much biotite mica.
132	142	Sand, fine to medium, loose, well sorted, much mica, few shell pieces, gray
142	158	Sand, fine, loose, much mica, gray.
158	164	Sand and silt, fine, loose, gray; with carbon matter.
164	165	Sand, medium, gray, with many shells and pieces.

Perforations

Not perforated

806C

Struck water at 56'

Water level before perf. after perf.

45/14W-11C2

Source LACFCD ✓

WELL LOG

45/14W-1F1 794-A

DEPARTMENT OF WATER & POWER
OF
THE CITY OF LOS ANGELES

DRW - B-103e

Well Number or Name Aluminum Co. of America No. 3

LOCATION 190th & Normandie Streets

1220' W. of Normandie Ave. - 1369' S. of 190th St. MAP No.

WORK STARTED 9-18-42 WORK COMPLETED 10-9-42

600 ft of 14 in 10 lb./ga casing was left in well

Type of perforator used Hydraulic

Perforated 514 ft. to 473 ft. 8 holes per 4"

Diameter of perforations 5/16 in., length in.

Depth at which water was first found 68 ft.

Standing level before perforating 69 to 80 ft.

Standing level after perforating 83 ft.

Note your observation of any change in water level while drilling

Date tested 19

Water level when first started test 83 ft.

Draw down from standing level ft.

G. P. M. at beginning of test

G. P. M. at completion of test 815

Draw down at completion of test 33 ft.

If reducing strings of casing were cut off, state how cut

Depth from surface cut ft.

Size of casing cut in.

Lap in larger casing ft.

Was adapter or cement used?

If casing was swedged or repaired, state depth, describe repairs and condition in which casing was left and probable future effect:

Is well straight top to bottom, if not, what is the variation?
Practically straight

Will there be any detrimental effect on pump, and if so, what?
None

Give any additional data which may be of future value

Total depth of well 600 ft

Formation: Mention size of water gravel—

From (ft.)	To (ft.)	Formation
0	154	Sandy clay, soft streaks
154	182	Fine sand
182	210	Blue sand and clay
210	290	Blue clay
290	292	Sand and gravel to 3/4"
292	420	Blue sandy clay
420	458	Clay
458	466	Fine to coarse sand
466	470	Blue clay
470	480	Sand to 1-1/2" gravel
480	490	Clay, sand and gravel
490	502	Sand gravel to 3"
502	512	Sand to 3/4" gravel
512	536	Sandy clay, some gravel
536	600	Fine sand and clay

Date of Report 10-14 42
Roscoe Moss Co.

In charge W. Peterson

SHOW LOCATION ON BACK

DIVISION OF WATER RESOURCES
DEPARTMENT OF PUBLIC WORKS
STATE OF CALIFORNIA

WELL LOG

SHEET 1

NUMBER 5-1736

LOCAL DESIGNATION #1

U.S.G.S. 4/14-1S1

Loc 794 A

LOCATION 1200 feet west of Normandy Avenue
1359 S. 190th Street

OWNER Aluminum Co. of America

DATE COMPLETED Oct. 1942

DIAMETER OF CASING 14"

DRILLED BY Roscoe Moss

SOURCE OF INFORMATION U.S.G.S. & LACFCD

INSPECTED WHILE DRILLING ______ SEE FILE NO. ______

SURFACE ELEVATION 51

SKETCH

Test
815 g.p.m. DD=33'

DEPTH	ELEVATION OF BOTTOM OF STRATUM	MATERIAL	THICKNESS FEET	% VOIDS	ABSOLUTE VOIDS FEET	TOTAL VOIDS FEET
0-154		Sandy clay - soft streaks				
154-182		Fine sand				
182-210		Blue sand and clay				
210-290		Blue clay				
290-292		Sand and gravel to 3/4"				
292-420		Blue sandy clay				
420-458		Clay				
458-465		Fine to coarse sand				
465-470		Blue clay				
470-480		Sand to 1½" gravel				
480-490		Clay, sand and gravel				
490-502		Sand, gravel to 3"				
502-512		Sand to 3/4" gravel				
512-536		Sandy clay, some gravel				
536-500		Fine sand and clay				
		Perforated 473-514				
		Water first struck 68'				
		" after perf. 83'				

FOR FIELD COPIES USE ALTERNATE LINES

LOG OBTAINED BY ______ DATE ______

FORM 1052 7-36 10161

WELL LOG

DEPARTMENT OF WATER & POWER
OF
THE CITY OF LOS ANGELES

4S/14W-1F2 176-C
DWR - B-1031

Well Number or Name Aluminum Co. of America No. 2

LOCATION 190th & Normandie Streets, Los Angeles

1220 W. of Normandie Ave., 1169 S. of 190th St. MAP No.

WORK STARTED 8-31-42 WORK COMPLETED 9-17-42

600 ft. of 14 in. 10 ga. casing was left in well

Type of perforator used Hydraulic

Perforated (ft)	to (ft)	holes per 4"
540	535	8
530	525	8
506	477	8

Diameter of perforations 5/16 in., length 1-3/4 in.

Depth at which water was first found 67 ft.

Standing level before perforating 64 to 79 ft.

Standing level after perforating 83 ft.

Note your observation of any change in water level while drilling

Date tested 19

Water level when first started test 83 ft.

Draw down from standing level ft.

G. P. M. at beginning of test

G. P. M. at completion of test 810

Draw down at completion of test 29 ft.

If reducing strings of casing were cut off, state how cut

Depth from surface cut ft.

Size of casing cut in.

Lap in larger casing ft.

Was adapter or cement used?

If casing was swedged or repaired, state depth, describe repairs and condition in which casing was left and probable future effect:

Is well straight top to bottom, if not, what is the variation?
Practically straight

Will there be any detrimental effect on pump, and if so, what?
None

Give any additional data which may be of future value

Total depth of well 600 ft.

Formation. Mention size of water gravel—

From (ft.)	To (ft.)	Formation
0	65	Sandy clay
65	157	Sandy clay - soft streaks
157	185	Fine sand
185	212	Blue sand and clay
212	420	Blue clay
420	428	Fine sand to 3/4" gravel
428	434	Blue sand and clay
434	456	Blue clay
456	462	Fine sand and clay
462	475	Blue clay
475	482	Sand and gravel to 1"
482	486	Clay and gravel
486	504	Sand and gravel to 2"
504	522	Sand and clay
522	528	Sand to 3/4" gravel
528	533	Fine sand, some gravel
533	538	Sand and gravel to 3/4"
538	545	Sand and clay
545	600	Sandy clay

Date of Report 9-21, 1942

Roscoe Moss Co.
Driller

In charge W. Peterson

SHOW LOCATION ON BACK

BOE-C6-0177975

FORM 118 INVESTIGATION

45/14W-1F2

DIVISION OF WATER RESOURCES
DEPARTMENT OF PUBLIC WORKS
STATE OF CALIFORNIA

SHEET 1

WELL LOG

NUMBER [illegible]

LOCAL DESIGNATION [illegible]

U.S.G.S. 4/14-1F2

Loc. 794 E

LOCATION 1220 feet west of Normandie Avenue
1169 feet south of 190th Street

OWNER Aluminum Co. of America

DATE COMPLETED October 1942

DIAMETER OF CASING 14"

DRILLED BY Roscoe Moss

SOURCE OF INFORMATION U.S.G.S. & LACFCD

INSPECTED WHILE DRILLING ______ SEE FILE NO. ______

SURFACE ELEVATION [illegible]

SKETCH

Test 810 g.p.m. DD=29'

DEPTH	ELEVATION OF BOTTOM OF STRATUM	MATERIAL	THICKNESS FEET	% VOIDS	ABSOLUTE VOIDS FEET	TOTAL VOIDS FEET
0- 55		Sandy clay				
65-157		Sandy clay soft streaks				
157-185		Fine sand				
185-212		Blue sand and clay				
212-420		Blue clay				
420-428		Fine sand to 3/8" gravel				
428-434		Blue sand and clay				
434-456		Blue clay				
456-462		Fine sand and clay				
462-475		Blue clay				
475-482		Sand and gravel to 1"				
482-486		Clay and gravel				
486-504		Sand and gravel to 2"				
504-522		Sand and clay				
522-528		Sand to 3/4" gravel				
528-533		Fine sand some gravel				
533-538		Sand and gravel to 3/4"				
538-545		Sand and clay				
545-600		Sandy clay				

Perforated 477-506
525-530
535-540

MICROFILMED

Water first struck 57'
" after perf. 83'

FOR FIELD COPIES USE ALTERNATE LINES

C-8

LOG OBTAINED BY ______ DATE ______

BOE-C6-0177976

4S/14W-1F2

SHEET 1

LOS ANGELES COUNTY
FLOOD CONTROL DISTRICT
HYDRAULIC DIVISION
WELL DATA

DOUGLAS AIRCRAFT CO. 6-5-70 7948

...ner: Aluminum Company of America
HARVEY ALUMINUM CO. 5-20-69

...cation and description: 1220 feet west of Normandie Ave.
1169 feet south of 190th Str.

...e:

...ev. of average grd. at well: 51' U. S. G. S. Datum

...ev. of grd. adjacent to well: U. S. G. S. Datum

...ater surface reference points:

(a) From To Elev. 52 How det. TOPO.
Description: N. SIDE OF PUMP, LOWER EDGE OF 1½" BREATHER PIPE 1' ABOVE GROUND

(b) From To Elev. How det.
Description:

(c) From To Elev. How det.
Description:

(d) From To Elev. How det.
Description:

...pe of well: Size 14"

...iginal depth: 600' Soundings:

...mping equipment:

...wer used:

...pacity: Test 810 g.p.m. Drawdown: 29'

...te drilled: October, 1942 By Roscoe Moss

...tesian characteristics:

...ality of water:

...marks: Cannot enter casing, pump 6-16-47 DWR
DWR SOURCE JAN 1957

4S/14W-1F2

Source LACFCD

LOG OF WELL NO. 794 B

FROM	TO	CLASSIFICATION OF MATERIALS	FROM	TO	CLASSIFICATION
0	65	Sandy clay			
65	157	Sandy clay, soft streaks			
157	185	Fine sand			
185	212	Blue sand and clay			
212	420	Blue clay			
420	428	Fine sand to 3/8" gravel			
428	434	Blue sand and clay			
434	456	Blue clay			
456	462	Fine sand and clay			
462	475	Blue clay			
475	482	Sand and gravel to 1"			
482	486	Clay and gravel			
486	504	Sand and gravel to 2"			
504	522	Sand and clay			
522	528	Sand to 3/4" gravel			
528	533	Fine sand, some gravel			
533	538	Sand and gravel to 1/2"			
538	545	Sand and clay			
546	600	Sandy clay			

Perforations 477' to 506', 525' to 530', 535' to 540'

Struck water at 67'

Water level before perf. ________ after perf. 83'

Remarks

OF
THE CITY OF LOS ANGELES

DWR-B-1039

Well Number or Name Aluminum Co. of America No. 1 4S/14W 1F3

LOCATION 190th & Normandie, Los Angeles
1247' W. of Normandie Ave., 803' S. of 190th St. MAP No.

WORK STARTED 7-31-42 WORK COMPLETED 8-29-42

600 ft. of 14 in. 10 ga. casing was left in well

Type of perforator used Hydraulic

Perforated	ft. to	ft.	holes per
550	538	8	4"
516	478	8	4"
433	427	8	4"

Diameter of perforations 5/16 in., length 1-3/4 in.

Depth at which water was first found 76 ft.

Standing level before perforating 76 ft.

Standing level after perforating 83 ft.

Note your observation of any change in water level while drilling

Date tested 19

Water level when first started test 83 ft.

Draw down from standing level ft.

G. P. M. at beginning of test

G. P. M. at completion of test 1375

Draw down at completion of test 33 ft.

If reducing strings of casing were cut off, state how cut

Depth from surface cut ft.

Size of casing cut in.

Lap in larger casing ft.

Was adapter or cement used?

If casing was swedged or repaired, state depth, describe repairs and condition in which casing was left and probable future effect:

Is well straight top to bottom, if not, what is the variation?
Pactically

Will there be any detrimental effect on pump, and if so, what?
None

Give any additional data which may be of future value:
Cement plug installed to 596'

Total depth of well 600

Formation: Mention size of water gravel—

From (ft.)	To (ft.)	Formation
0	3	Topsoil
3	68	Clay
68	118	Sandy clay - soft streak
118	122	Fine brown sand
122	134	Brown sandy clay
134	153	Blue clay - streaks sand
153	187	Fine blue sand
187	214	Blue sandy clay
214	316	Blue clay
316	324	Blue clay - 1/4" embedded gravel
324	330	Blue clay
330	333	Blue clay - 1/4" embedded grav
333	418	Blue clay
418	424	Fine muddy sand, some 1/4" to 1/2" gravel
424	432	Fine sand and clay
432	437	" " " "
437	460	Fine sandy clay
460	470	Fine sand and clay
470	474	Blue clay
474	482	Sand and gravel to 1"
482	495	" " " to 3/4"
495	515	" " " to 2"
515	519	" " " " 1/2"
519	536	Fine sand and clay
536	547	Sand and gravel to 1"
547	573	Fine sandy clay
573	600	Blue clay

Date of Report Sept. 2, 1942
Roscoe Moss Co.
Driller

In charge W. Peterson

SHOW LOCATION ON BACK

C-11

BOE-C6-0177979

Form 11B

INVESTIGATION

____

____

4S/14W-1F3

SHEET 1

DIVISION OF WATER RESOURCES

DEPARTMENT OF PUBLIC WORKS

STATE OF CALIFORNIA

WELL LOG

NUMBER B-1C3E

LOCAL DESIGNATION 43

U.S.G.S. 4/14 1F3

Loc. 794 C

LOCATION 1247 feet west of Normandy Avenue

803 feet south of 190th Street

OWNER Aluminum Co. of America

DATE COMPLETED August 1942

DIAMETER OF CASING 14"

DRILLED BY Roscoe Moss

SOURCE OF INFORMATION U.S.G.S. & LACoFCD

INSPECTED WHILE DRILLING ________ SEE FILE NO. ________

SURFACE ELEVATION 51

SKETCH

Test 1375 gpm at DD=33'

FOR FIELD COPIES USE ALTERNATE LINES

DEPTH	ELEVATION OF BOTTOM OF STRATUM	MATERIAL	THICKNESS FEET	% VOIDS	ABSOLUTE VOIDS FEET	TOTAL VOIDS FEET
0- 3		Top soil				
3- 68		Clay				
68-118		Sandy clay - soft streaks				
118-122		Fine brown sand				
122-134		Brown sandy clay				
134-153		Blue clay - streaks sand				
153-187		Fine blue sand				
187-214		Blue sandy clay				
214-316		Blue clay				
316-324		Blue clay - 1/4" embedded gravel				
324-330		Blue clay				
330-333		Blue clay 1/4" embedded gravel				
333-418		Blue clay				
418-424		Fine muddy sand some 1/4" to 1/2" gravel				
424-432		Fine sand to 3/8" clay				
432-437		Fine sand and clay				
437-450		Blue sandy clay				
450-470		Fine sand and clay				
470-474		Blue clay				
474-482		Sand and gravel to 1"				
482-495		Sand and gravel to 3/4"				
495-515		Sand and gravel to 2"				
515-519		Sand and gravel to 1/2" muddy				
519-536		Fine sand and clay				
536-547		Sand and gravel to 1"				
547-573		Fine sandy clay				
573-600		Blue clay				
		Perf. 427-433				
		473-516				
		537-560				
		Water first struck 78'				
		" after perf. 67'				

MICROFILMED

C-12

LOG OBTAINED BY ________________ DATE ________

BOE-C6-0177980

4S/14W-1F3

SHEET 1

LOS ANGELES COUNTY
FLOOD CONTROL DISTRICT
HYDRAULIC DIVISION
WELL DATA

794c

Owner: Aluminum Company of America

Location and description: 1247 feet west of Normandie Ave. 803 feet south of 190th Str.

1225' W ℄ of Normandie Ave.; 800' So ℄ of 190th St.; 375' West 794B-in red brick pump house DWR 8-11-59

Use:

Elev. of average grd. at well: 51' U.S.G.S. Datum

Elev. of grd. adjacent to well: U.S.G.S. Datum

Water surface reference points:

(a) From To Elev. 51 How det. TOPO
Description: 1" PIPE ON N. SIDE OF PUMP BASE AT GROUND.

(b) From 4-16-59 To Elev. 50.8 How det. Al. topo
Description: Hole in Ne. side of pump base, 0.2 below grad level

(c) From To Elev. How det.
Description:

(d) From To Elev. How det.
Description:

Type of well: Size 14"

Original depth: 600'(DWR) (596' - USES) Soundings:

Pumping equipment:

Power used:

Capacity: Test: 1375 g.p.m. Drawdown: 33'

Date drilled: August 1942 By ROSCOE MOSS CO.

Artesian characteristics:

Quality of water:

Remarks: Cannot enter casing, pump 1947 - DWR DATA FROM DWR 1/1959

DRILLING AND CONSTRUCTION OF MONITOR WELLS

In accordance with the on-site groundwater sampling plan (Hargis & Associates, 1985), a total of five monitor wells were constructed on the site to obtain groundwater samples from the uppermost water bearing zone (Figure 2). These monitor wells were also constructed to define geologic conditions. Soil samples were collected during the drilling of the monitor wells. All of the monitor wells were completed in the upper portion of the first water bearing zone.

All of the monitor wells were constructed in April 1985 by A&W Drilling, Inc., Los Angeles, California. Each well was drilled to a depth of approximately ten feet below land surface using a 24-inch bucket auger. Ten feet of eighteen-inch steel surface casing was then set and cemented. Each borehole was then completed to total depth using a 16-inch bucket auger. Caving conditions at the water table prevented penetration of more than a few feet below the water table.

Detailed lithologic logs were compiled during drilling of the monitor boring (Tables A-1 through A-7). Soil samples were obtained at five-foot intervals using a split-tube sampler. Monitor well MW-2 was initially located about 20 feet south of the location shown on Figure 2. Concrete debris and other materials were encountered at a depth of about 20 feet below land surface and the hole could not be advanced. This hole was abandoned, and is designated soil boring MW-2A (Table A-2). The abandoned hole was backfilled with the cuttings. The drilling equipment was steam cleaned, moved 20 feet north, and monitor well MW-2 was constructed (Figure 2).

No drilling fluids or mud were used in the construction of the monitor wells. With the exception of the first 10 feet of cuttings, all drill cuttings were stockpiled at the wellsite. The cuttings from the first ten feet of each borehole were removed from the vicinity of each borehole and stored in a steel bin at the eastern end of the site. Upon completion of drilling, the steel bin was covered with sheet plastic to prevent dissipation of the cuttings by the wind. The bucket auger rig was steam cleaned prior to drilling each monitor well, and after completion of the last monitor well.

All monitor wells were constructed with four-inch flush-threaded schedule 40 PVC blank and slotted casing. Casing slots are one inch long by 0.030-inch wide. The four-inch casing contains 160 slots per foot. A ten-foot joint of slotted casing was set on the bottom of each borehole (Figures A-2 through A-6). Blank casing was installed from above the slotted casing to land surface. The annulus between the PVC casing and the borehole wall was then filled with a clean, dry Monterey sand to a depth of between 5.5 and 8.5 feet above the slotted casing. After placement of the sand pack, the annulus was backfilled with dry cuttings to within ten feet of land surface. The annulus was then sealed to land surface with concrete. The top of the PVC casing was cut off below land surface and capped with a PVC cap. A three-foot long joint of eight-inch steel casing was then cemented in place over the PVC. This steel casing is fitted with a locking lid. Construction data for each monitor well are presented in Table A-8.

The as-built details of the monitor wells differ from the construction proposed in the on-site sampling plan in several respects. Based on comments received via letter from EPA dated 24 April 1985, the well construction was modified to include steel surface casing cemented from land surface to a depth of ten feet. Because of the dry nature of the sediments encountered above the water table, the cement bentonite seal above the gravel pack was unnecessary and was not installed. The borehole annulus of each well was backfilled with dry cuttings from that well instead of backfilling with imported soil or pea gravel. Because the site is now paved and no source of recharge exists that might create a perched groundwater zone beneath the site, it was unnecessary to import clean soil or pea gravel to backfill the annulus. Without a source of recharge, chemical residues that might be present in the backfilled cuttings would probably not be transported to the water table. The ten-foot surface cement seal provides additional protection against potential infiltration of surface runoff.

TABLE A-1

LITHOLOGIC LOG OF MONITOR WELL MW-1

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
0-1.5	Fill:	Asphalt, bricks, in clay matrix.
1.5-6	Clay:	Some sand, dark brown, slightly moist, very stiff, cohesive.
6-11	Clayey sand/ sandy clay:	Light yellow brown, slightly moist, firm, moderately cohesive, sand is fine grained.
11-18	Sandy clay:	Light brown, dry, firm. At 15-18 feet, increasing sand.
18-22	Clayey sand:	Light brown, dry, loose, very fine grained. At 20-22 feet, increasing clay.
22-28	Sandy clay:	Light brown with dark brown streaks, dry. At 25-28 feet, increasing sand.
28-30	Sand:	Very light brown, dry, loose, very fine grained, trace of clay.
30-37	Sand:	Very light brown, dry, loose. At 35-37 feet, trace of clay.
37-40	Sand:	Very light brown, dry, loose.
40-49	Sand:	Light yellowish brown, slightly moist, very fine grained, loose, with occasional trace of clay, slightly sweet odor, occasional orange staining. At 46 feet, sand, light orange brown. At 47 feet, sand, light yellow brown. At 48 feet, sand, light orange brown. At 49 feet, cemented zone, sand is very fine grained, with some shell fragments.

TABLE A-1

LITHOLOGIC LOG OF MONITOR WELL MW-1 (Continued)

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
49-53	Sand:	Light yellow brown, slightly moist, loose with occasional well-cemented nodules, sand is very fine grained, occasional thin clay lenses, no odor.
53-64	Sand:	Light yellow brown, occasional orange stains, slightly moist, loose, sand very fine grained, slight sweet odor.
		At 64 feet, slight increase in clay content.
64-69	Sand:	Light yellow brown, slightly moist, loose, sand is very fine grained, no odor, some clay nodules, clay is firm, slightly cohesive.
		At 68 feet, clayey sand, light brown, moist, firm, sand is very fine grained, clay is moderately cohesive.
		At 69.5 feet, water.
69-77	Sand:	Interbedded with clayey sand, light brown, wet, sand is loose, fine grained, clay is firm, moderately cohesive, interbeds average about 3 inches, occasional orange staining.
		At 75 feet, clayey sand, interbedded with sand, light brown, moist, sand is fine grained, clay is firm, moderately cohesive
		At 77 feet, sandy clay with some sand stringers, light brown with orange brown lenses, wet, very firm, very cohesive, sand is fine grained.

TABLE A-2

LITHOLOGIC LOG OF MONITOR WELL MW-2A

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
0-10	Fill:	Concrete wood, bricks, in clay matrix, sweet organic odor.
		Hole abandoned by backfilling with cuttings; move 20 feet north and start MW-2.

TABLE A-3

LITHOLOGIC LOG OF MONITOR WELL MW-2

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
0-4	Fill:	Concrete, asphalt fragments, wood, bricks in clay matrix.
4-6	Clay:	Dark brown, slightly moist, very stiff, very cohesive, trace of sand.
6-11	Clayey sand:	Light yellow brown, slightly moist, loose, fine grained, clay is moderately cohesive.
11-15	Sandy clay:	Light brown, slightly moist, firm, moderately cohesive.
15-24	Clay:	Gray brown, slightly moist, stiff, very odiferous. At 22 feet, purple concretions.
24-27	Sandy clay:	Brown, slightly moist, loose, sand is fine grained, stiff clay interbeds, intermixed purple concretions.
27-29	Clay sand:	Brown, slightly moist, loose, uniform, sand is fine grained. At 28 feet, sand is tan, occasional clay masses. At 29 feet, sparse shell fragments.
29-43	Sand:	Reddish brown, slightly moist, loose, uniform, fine grained. At 32 feet, more micaceous. At 35 feet, shell fragments consolidated. At 37-38 feet, consolidated shell zones, well cemented, occasional clay. At 40 feet, purple concretions of shell material, stained black.

TABLE A-3

LITHOLOGIC LOG OF MONITOR WELL MW-2 (Continued)

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
		At 41 feet, more cemented, black stain, odiferous.
		At 42 feet, sand is gray in color.
43-77	Sand:	Reddish brown, slightly moist, odiferous, loose, fine grained.
		At 46 feet, interbeds of sandy clay/clay, interspersed oxidized zones, trace of stiff cobble-sized clay masses.
		At 52 feet, well cemented sandy clay nodules.
		At 54-55 feet, well cemented sand with shell fragments.
		At 58 feet, interspersed oxidized zones.
		At 63 feet, some consolidated, cemented shell fragments.
		At 64 feet, sand is gray, very odiferous.
		At 65 feet, sand is reddish brown, some clay nodules, occasional cemented sand nodules.
		At 66 feet, sand is gray.
		At 68 feet, some shell fragments
		At 70 feet, increasing moisture, sandy clay lens, clay is stiff.
		At 72-73 feet, more sandy clay interbeds.
		At 73-74 feet, interbeds of sandy clay/clayey sand.
		At 75 feet, interbeds of sandy clay with some well cemented clayey sand.

TABLE A-3

LITHOLOGIC LOG OF MONITOR WELL MW-2 (Continued)

DEPTH INTERVAL (FEET)	DESCRIPTION OF MATERIAL	
77-78	Sandy clay:	Light brown, slightly moist, odiferous, firm, moderately cohesive, sand is very fine grained.
78-80	Clayey sand:	Light brown, saturated, streaks of coarser orange sand.

TABLE A-4

LITHOLOGIC LOG OF MONITOR WELL MW-3

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
0-3.5	Fill:	Asphalt fragments, brown clay matrix.
3.5-9	Clay sand:	Light brown, slightly moist, no odor, slightly cohesive, dense.
9-10	Sandy clay:	Light brown, moist, no odor, cohesive, firm.
10-16	Sandy clay:	Brown, slightly moist, clay is moderately cohesive, sand is fine grained, loose.
		At 14 feet, clay interbeds, clay is moist, stiff, gray, has some sand, very fine grained, sand is brown, slightly red.
16-18	Clay:	Some sand, clay is slightly moist, stiff, reddish brown.
18-19	Sandy clay:	Reddish brown, slightly moist, very fine grained, clay is moderately cohesive.
19-22	Clayey sand:	Reddish brown, slightly moist, sand is very fine grained, clay is moderately cohesive.
		At 21 feet, interbeds of sandy clay.
22-25	Sand:	Reddish brown to tan, slightly moist, loose, uniform, fine grained, trace of clay.
25-44	Sand:	Reddish brown, slightly moist, loose, uniform, fine grained.
		At 33 feet, small clay nodules.
		At 36 feet, sand is lighter in color.
		At 37 feet, clay nodules, some medium sand.
		At 39 feet, sand is redder, moister.
		At 40 feet, sand is tan, grayish tan, some interbeds of clayey sand.

TABLE A-4

LITHOLOGIC LOG OF MONITOR WELL MW-3 (Continued)

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
		At 42 feet, interbeds of shells in clayey matrix.
		At 43 feet, shells in moist clayey sand matrix, sand is medium grained, loose.
44-46	Clayey sand:	Gray to brown, moist, sand is medium grained, red oxidation bands, some shell fragments.
46-67	Sand:	Gray-brown, slightly moist, fine grained, loose, uniform, trace of clay.
		At 49 feet, changes to rust colored, micaceous, some burnt orange, slightly cohesive nodules.
		At 55 feet, orange sand.
		At 56 feet, some clayey sand, light brown, slightly moist, firm, slightly cohesive.
		At 60 feet, clayey sand lens.
		At 67 feet, some consolidated shell nodules.
		At 63 feet, shell nodules interbedded.
		At 66 feet, color change to silvery gray.
		At 66-67 feet, clay lens with some sand, clay is cohesive, soft, sand is very fine-grained.
67-68	Sandy clay:	Some shell fragments, clay is slightly moist, moderately cohesive, sand is medium to coarse grained.
68-78	Sand:	Orange brown, slightly moist, medium grained, sand is loose, uniform.

TABLE A-4

LITHOLOGIC LOG OF MONITOR WELL MW-3 (Continued)

DEPTH INTERVAL (FEET)	DESCRIPTION OF MATERIAL
	At 69 feet, clay interbeds, with interspersed shell fragments, sand is slightly moist, stiff, dense.
	At 70 feet, sand is tan, micaceous.
	At 74 feet, sand is medium coarse, with fine shell fragments.
	At 75 feet, sand is saturated.
	At 76 feet, some clay nodules.
	At 77 feet, some shell fragments.
	At 77-78 feet, increased shell fragments.

TABLE A-5

LITHOLOGIC LOG OF MONITOR WELL MW-4

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
0-1	Fill:	Asphalt, bricks, in clay matrix.
1-4	Clay:	Dark brown, very slightly moist, very stiff, very cohesive.
4-10	Sandy clay:	Medium brown, slightly moist, sand is very fine grained, clay is firm, moderately cohesive.
		At 6 feet, striated lenses, dark brown, yellow, orange.
		At 6-10 feet, increasing sand content.
10-18	Clay:	Brown, slightly moist, trace of sand, sand is very fine grained, clay is moderately cohesive.
		At 17 feet, clay is moist.
18-19	Clay/sandy clay:	Clay is looser, sand is fine grained.
19-21	Clay/sandy clay:	Traces of gravel.
21-23	Sandy clay:	Light brown, slightly moist, moderately cohesive, sand is fine-grained.
23-25	Sandy clay/ clayey sand:	Reddish brown, interbedded clay lenses.
25-26	Clayey sand/ sand:	Reddish brown, slightly moist, sand is fine grained.
26-37	Sand:	Dry, very fine grained, loose, trace of clay.
		At 31 feet, more tan in color.

TABLE A-5

LITHOLOGIC LOG OF MONITOR WELL MW-4 (Continued)

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
		At 34 feet, sand slightly coarser.
		At 36 feet, dry, loose sand.
37-38	Sand:	Light gray, cemented, abundant shell fragments.
38-41	Clayey sand:	Tan, cemented, shell fragments.
41-42	Clay sand:	Brown, clay is moist, sand is fine grained, shell fragments, interbeds of sandy clay.
45-50	Sand:	Reddish brown, dry, medium grained, loose.
		At 47 feet, sand is lighter in color.
		At 48 feet, some oxidized masses.
50-55	Sand:	Reddish brown, slightly moist, loose, medium grained, occasional cemented fragments.
		At 51 feet, small clay nodules.
55-64	Sand:	Same as above with indurated clay masses.
		At 57 feet, small clay nodules, sand is grayish brown, sand is medium grained.
		At 58 feet, indurated cobble-size clay nodules.
		At 60 feet, small clay nodules.
		At 61 feet, interbeds of red sand.
64-67	Sand:	Reddish brown, slightly moist, medium grained, loose, occasional cemented fragments.
67-69	Clayey sand/ sand:	Gray, moist, loose, clay nodules, sand is medium fine-grained.

TABLE A-5

LITHOLOGIC LOG OF MONITOR WELL MW-4 (Continued)

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
69-76	Sand:	Gray, moist to wet, loose, fine grained.
		At 71 feet, sand is wet.
		At 72 feet, some clay.
		At 73 feet, some clay interbeds.
		At 75 feet, sand is saturated.
		At 76 feet, sand is coarser grained.

TABLE A-6

LITHOLOGIC LOG OF MONITOR WELL MW-5

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
0-1	Fill:	Aggregate, gravel in sand matrix.
1-3	Clay:	Some sand, dark brown, slightly moist, very stiff, very cohesive.
3-9	Sandy clay:	Medium brown, slightly moist, firm, moderately cohesive, sand is very fine grained.
		At 4-9 feet, becomes sandier, lighter brown.
9-11	Clayey sand:	Light brown, slightly moist, firm, slightly cohesive, sand is fine grained.
11-29	Clayey sand:	Light yellow brown, slightly moist, loose, sand is fine grained, clay is moderately cohesive.
		At 16 feet, occasional very thin, light orange clay lenses.
		At 24 feet, slightly dense.
		At 29 feet, some clay.
29-43	Sand:	Light yellow brown, slightly moist, loose, sand is very fine grained, very uniform.
		At 29-31 feet, shell fragments.
		At 39 feet, occasional very well cemented sand.
		At 41 feet, occasional very well cemented sand.
43-47	Sand:	Light orange brown, slightly moist, interbedded loose and very well cemented, sand is fine to medium grained.

TABLE A-6

LITHOLOGIC LOG OF MONITOR WELL MW-5 (Continued)

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
47-52	Sand:	Light orange brown, dry, well cemented, sand is fine grained, interbedded shell fragments, occasional clay nodules.
52-63	Sand:	Light yellow brown, slightly moist, loose, sand is very fine grained, uniform.
		At 58 feet, moist.
		At 59 feet, some orange staining.
		At 62 feet, increasing clay.
63-70	Clay/sandy Clay:	Red brown with orange staining, slightly moist, firm, moderately cohesive. Sand is tan, slightly moist, loose, fine grained.
		At 67 feet, slightly sweet odor, increasing moisture content.
		At 68 feet, occasional dense sand.
		At 70 feet, saturated sand.
70-72	Sand:	Tan, saturated, loose, fine grained, very uniform.

TABLE A-7

LITHOLOGIC LOG OF SOIL BORING S-101

DEPTH INTERVAL (FEET)	DESCRIPTION OF MATERIAL	
0-17	Fill:	Asphalt fragments, cement, wood, wire in dark brown sandy clay matrix, no odor.
17-18	Fill:	Purplish-gray, sandy matrix, brick and concrete fragments.
18-23	Clay:	Pale gray, slightly moist, highly odiferous, cohesive, trace of sand.
23-25	Sandy clay:	Gray, slightly moist, cohesive, sand is fine grained, purple concretions.
25-30	Sand:	Yellowish, slightly moist, loose, interbedded with limey material, purple stains.
		At 26 feet, increasing clay.
		At 30 feet, contact with native material (?).
30-37	Sand:	Light brown, slightly moist, medium grained, loose, sand still contains some purple staining, highly odiferous.
		At 35 feet, decreasing purple stains.
		At 36 feet, increasing purple stains, highly odiferous.
37-40	Sand:	Well cemented, extremely hard, odiferous, contains nodules of hard indurated black-stained clay, numerous shell fragments.
40-45	Sand:	Brown, slightly moist, medium grained, contains shell fragments, intermittent purple stain.
		At 41 feet, well cemented shell fragments, intermittent purple stain.
		At 42 feet, well cemented, very hard.

TABLE A-7

LITHOLOGIC LOG OF SOIL BORING S-101 (Continued)

DEPTH INTERVAL (FEET)		DESCRIPTION OF MATERIAL
45-50	Sand:	Brown, slightly moist, loose, uniform, medium grained, odiferous.
		At 47 feet, sand is yellowish brown in color.
		At 48 feet, occasional cohesive clay nodules.
		At 50 feet, sand is uniform, yellow brown, medium grained, odiferous.

TABLE A-8

MONITOR WELL CONSTRUCTION DATA

WELL IDENTIFIER	DATE DRILLED	DEPTH OF WELL (FEET)[1]	PERFORATED INTERVAL (FEET)	TOP OF SAND PACK (FEET)	LAND SURFACE ELEVATION (FEET, amsl)	REFERENCE POINT ELEVATION (FEET, amsl)[2]
MW-1	4-26-85	76.6	63.0-73.0	57.5	42.84	42.77
MW-2	4-27-85	77.5	66.7-76.7	59.7	49.43	48.77
MW-3	4-26-85	75.0	64.4-74.4	55.9	47.50	47.66
MW-4	4-26-85	75.3	64.9-74.9	56.7	46.89	47.08
MW-5	4-25-85	72.4	61.5-72.5	55.0	45.36	45.16

NOTE: Unless otherwise noted, all measurements refer to feet below land surface. Land surface elevations are referenced to City of Los Angeles elevation grid.

1 Indicates drilled depth. In some cases, caving was severe and prevented placing of casing to bottom of hole.

2 Reference point is top of PVC casing; amsl - above mean sea level.

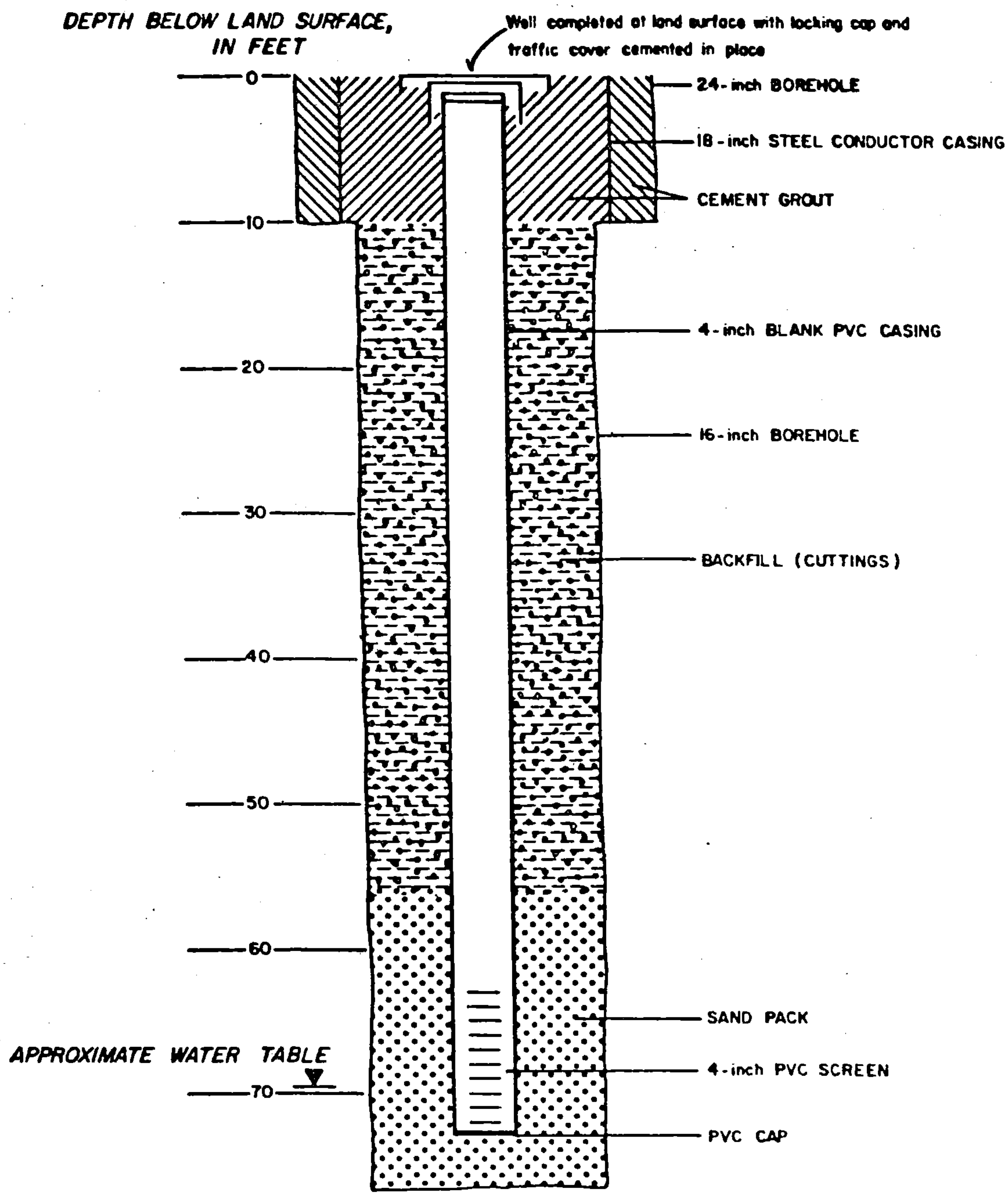


FIGURE A-1. SCHEMATIC CONSTRUCTION DIAGRAM OF MONITOR WELL MW-1

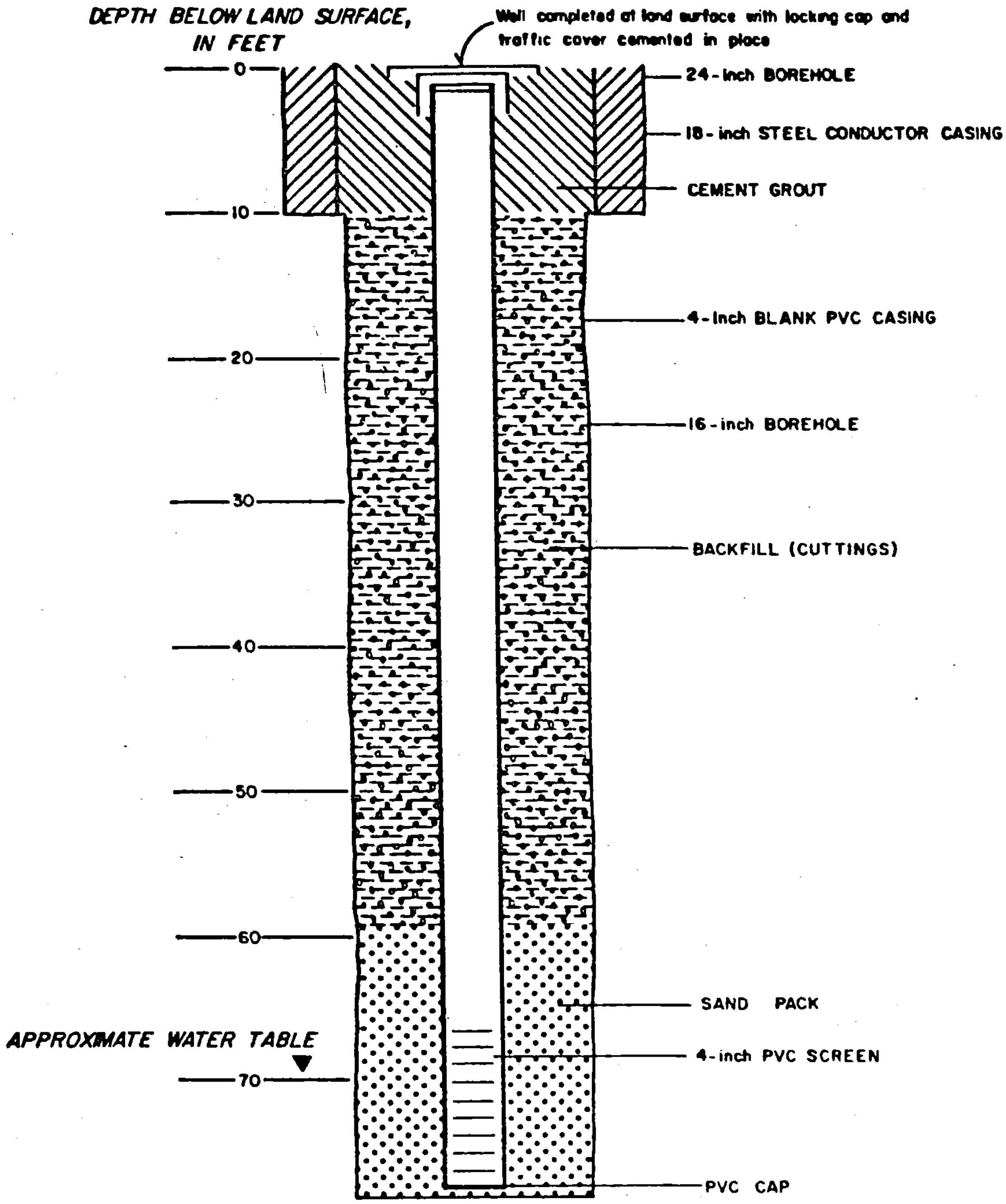


FIGURE A-2. SCHEMATIC CONSTRUCTION DIAGRAM OF MONITOR WELL MW-2

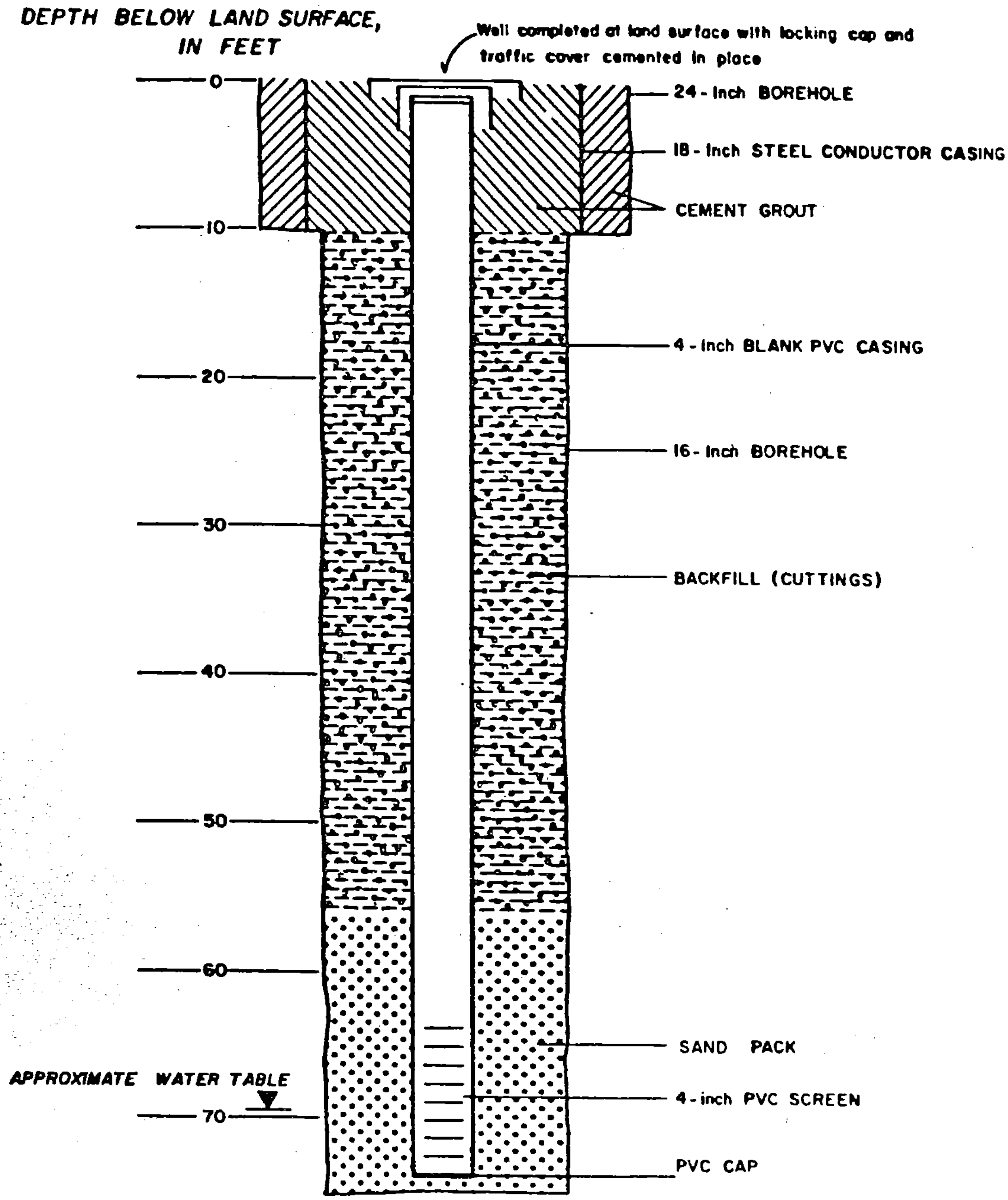


FIGURE A-3. SCHEMATIC CONSTRUCTION DIAGRAM OF MONITOR WELL MW-3

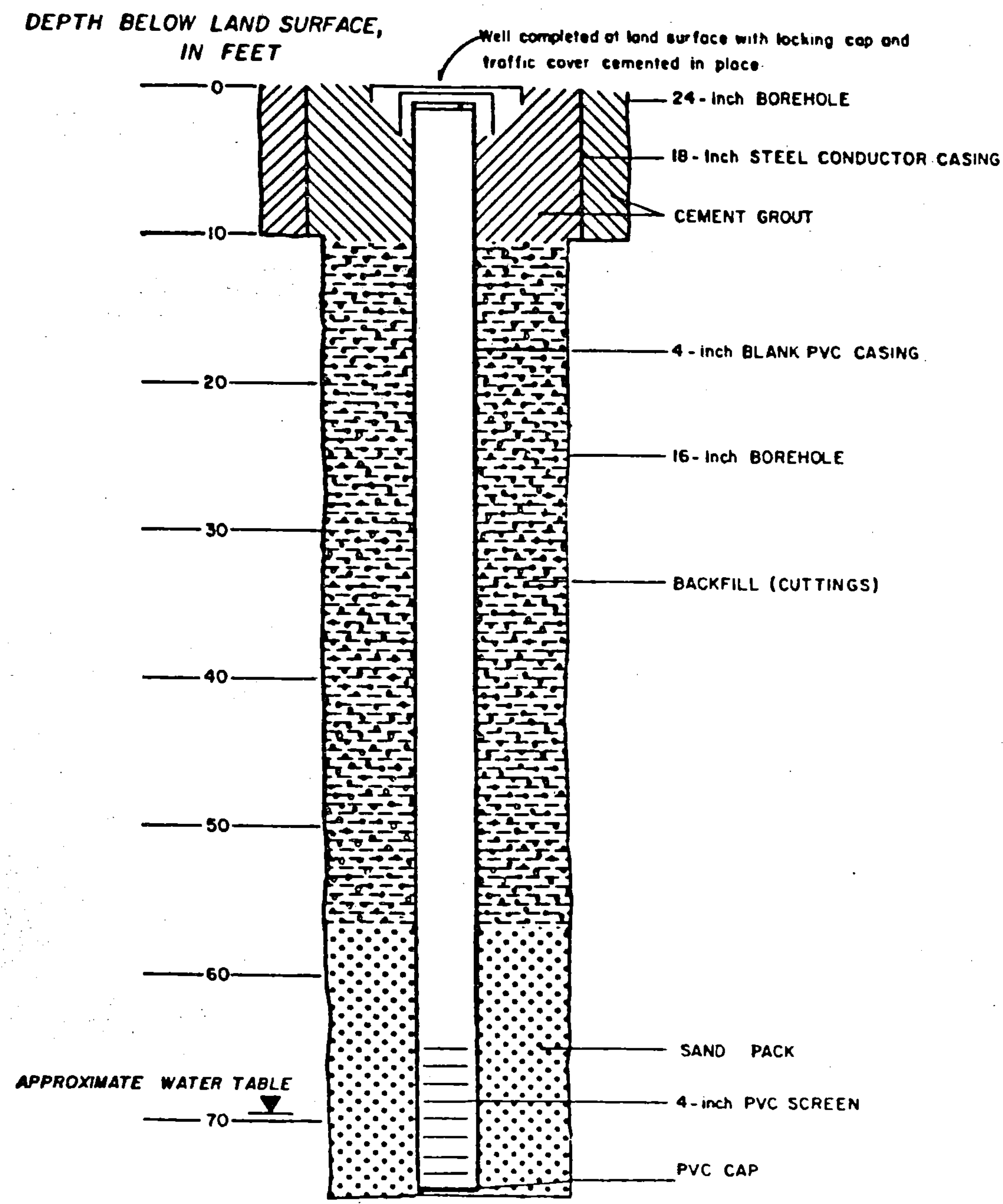


FIGURE A-4. SCHEMATIC CONSTRUCTION DIAGRAM OF MONITOR WELL MW-4

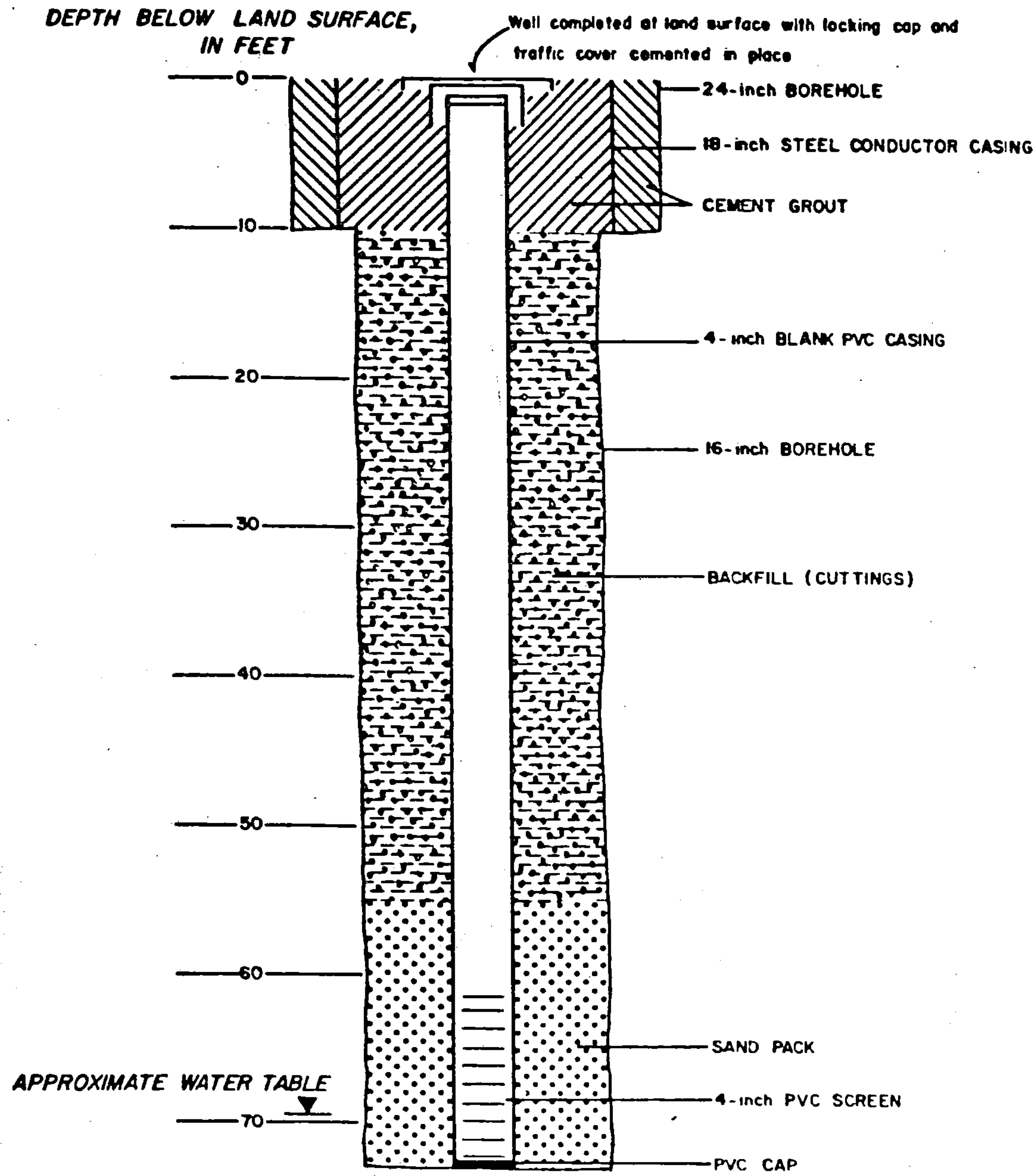


FIGURE A-5. SCHEMATIC CONSTRUCTION DIAGRAM OF MONITOR WELL MW-5

HARDING ASSOCIATES

APPENDIX D

SAMPLE NUMBERING SYSTEM

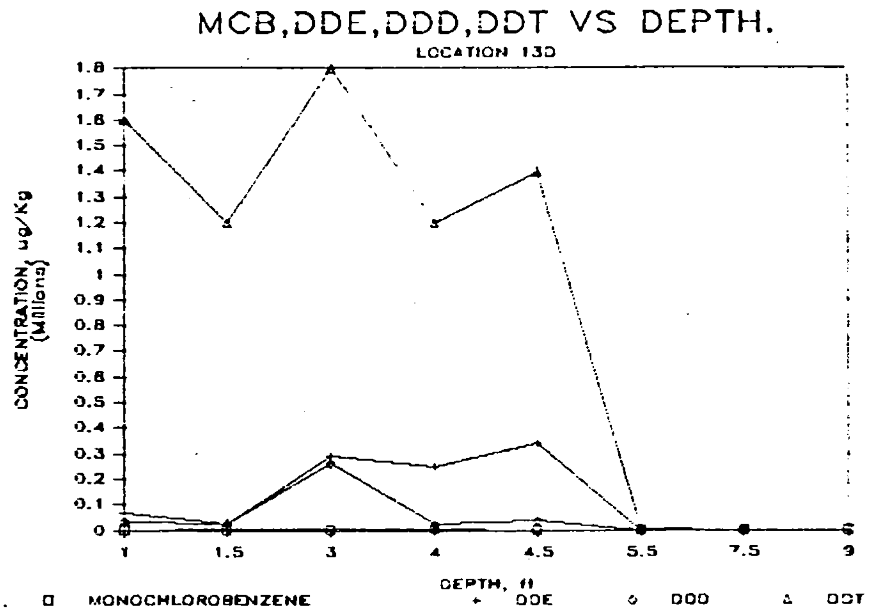
Appendix D
SAMPLE NUMBERING SYSTEM

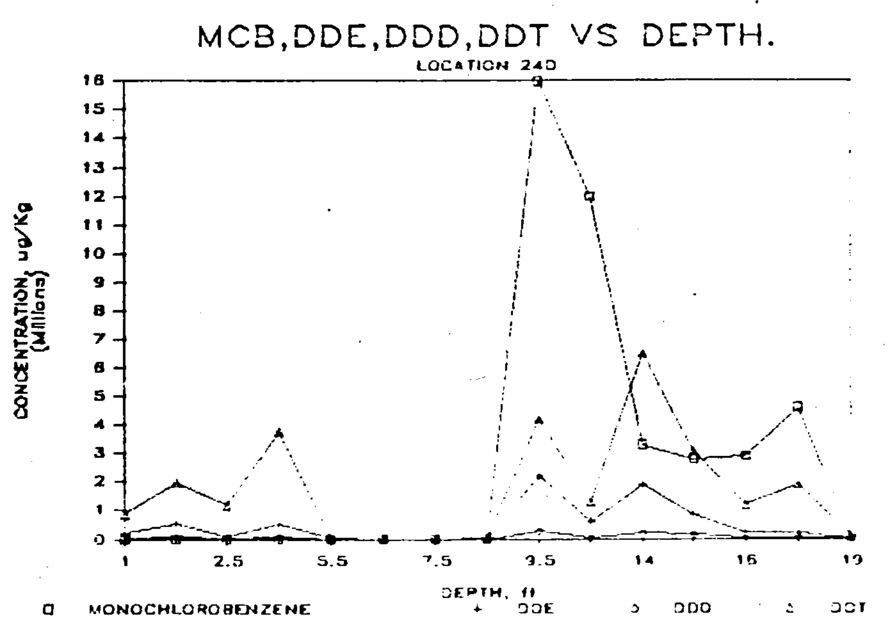
Field sample numbers for soils were assigned by borehole location and depth. For example, a field sample number is expressed as 14D-1.0-1.5. The 14D refers to grid row 1, column 4, quadrant D. The site grid system was shown in Figure A-1 in Appendix A. The subsequent numbers, 1.0-1.5, refer to the depth at which the sample was taken. Since the sample tubes were 6 inches in length, the interval is 6 inches. Field sample numbers for water were assigned numerically by monitoring well number (MW1-1, MW1-2, etc.)

Chemical lab analysis numbers were assigned to samples, in addition to field sample numbers. A single sample could have an inorganic, organic, and special analysis number associated with it. Inorganic numbers are of the form MYA123. Organic numbers are of the form YB123. Special analyses numbers are of the form 1765Y-12. The routine inorganic and organic analyses were selected for 4- and 10-foot soil depths and all water samples. The other soil depths selected for analysis only have special analysis numbers associated with them.

APPENDIX E

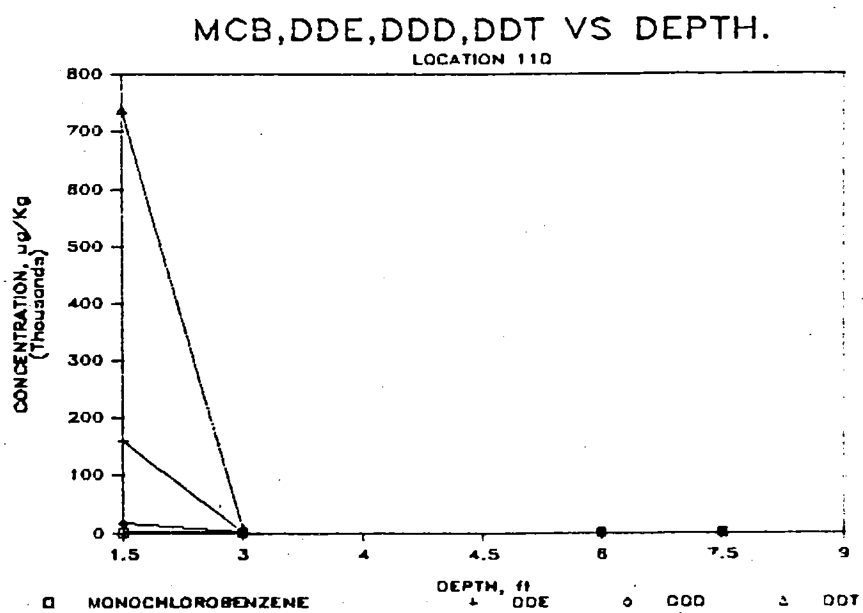
RESULTS OF SOIL ANALYSES





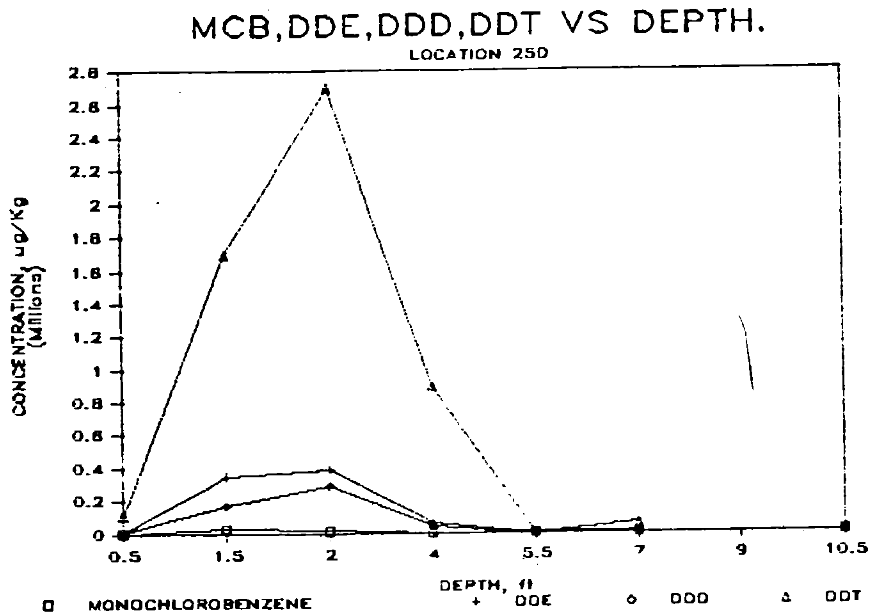
CHEMICALS OF CONCERN:

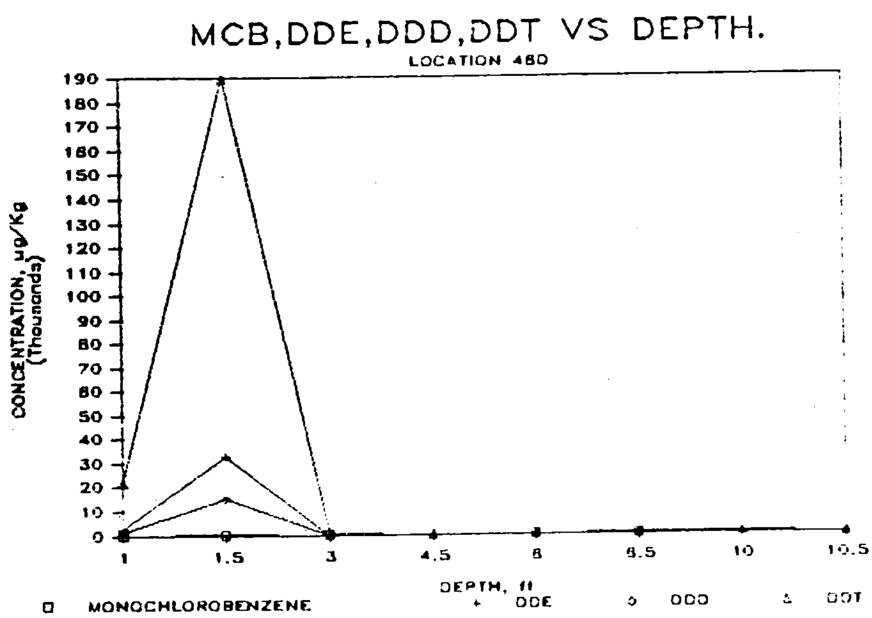
CONCENTRATION VERSUS DEPTH AT BOREHOLES 13D AND 24D



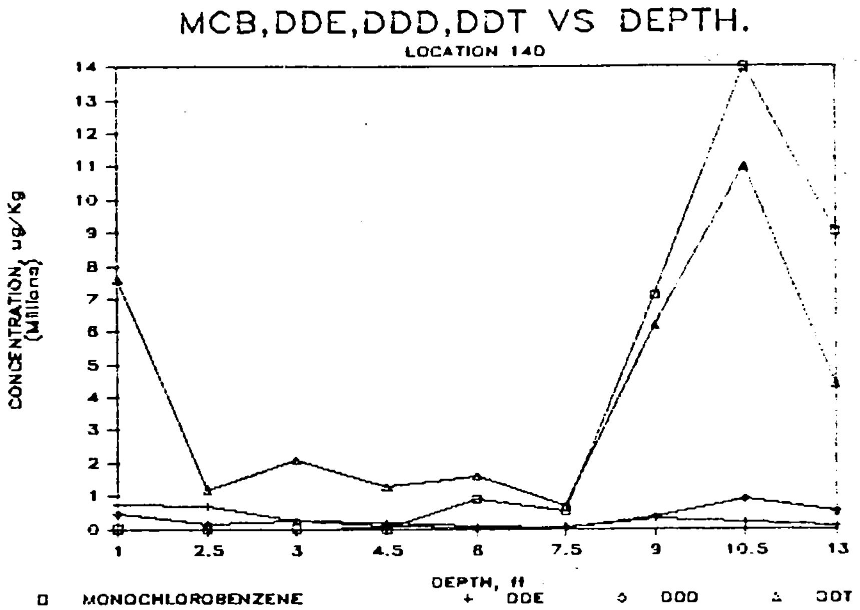
CHEMICALS OF CONCERN:

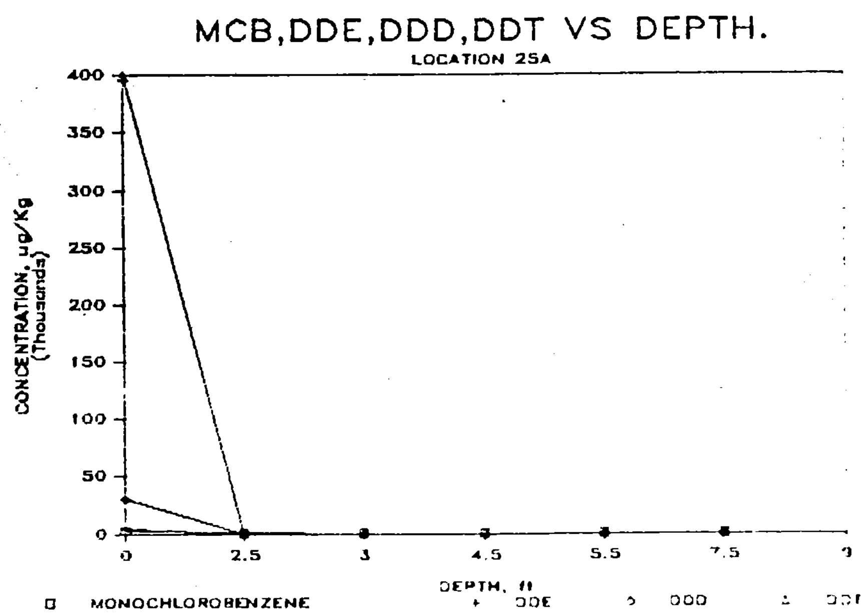
CONCENTRATION VERSUS DEPTH AT BOREHOLE 11D





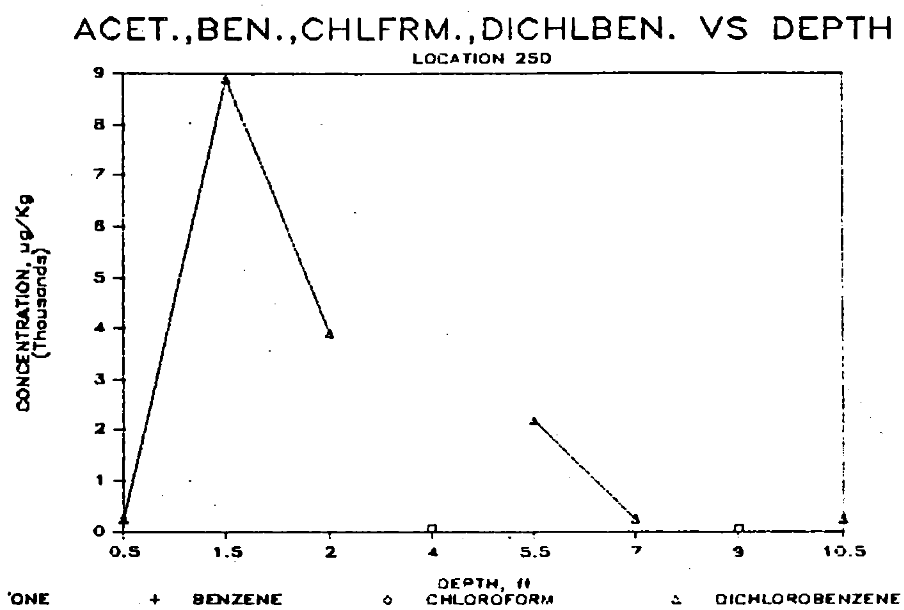
CHEMICALS OF CONCERN:
CONCENTRATION VERSUS DEPTH AT BOREHOLES 25D AND 48D

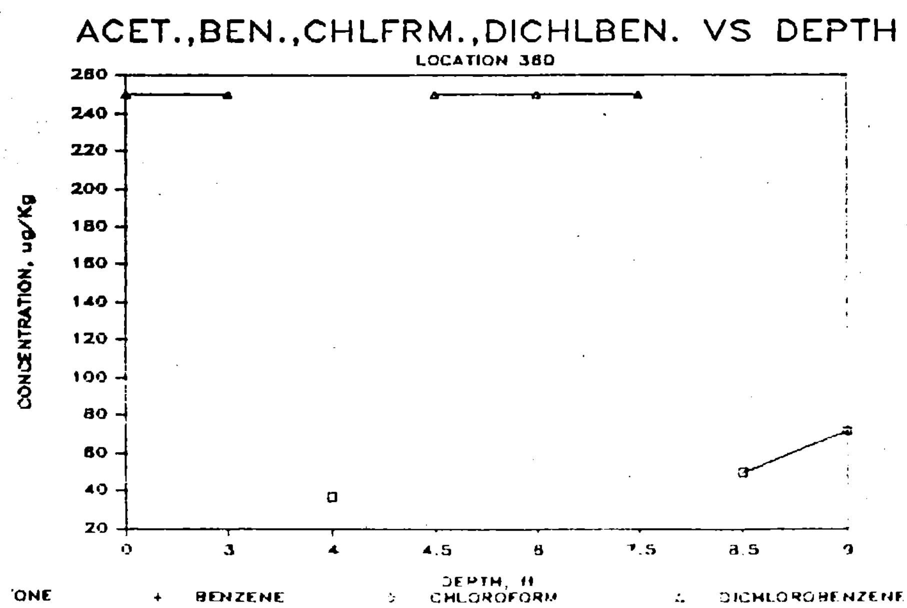




CHEMICALS OF CONCERN:

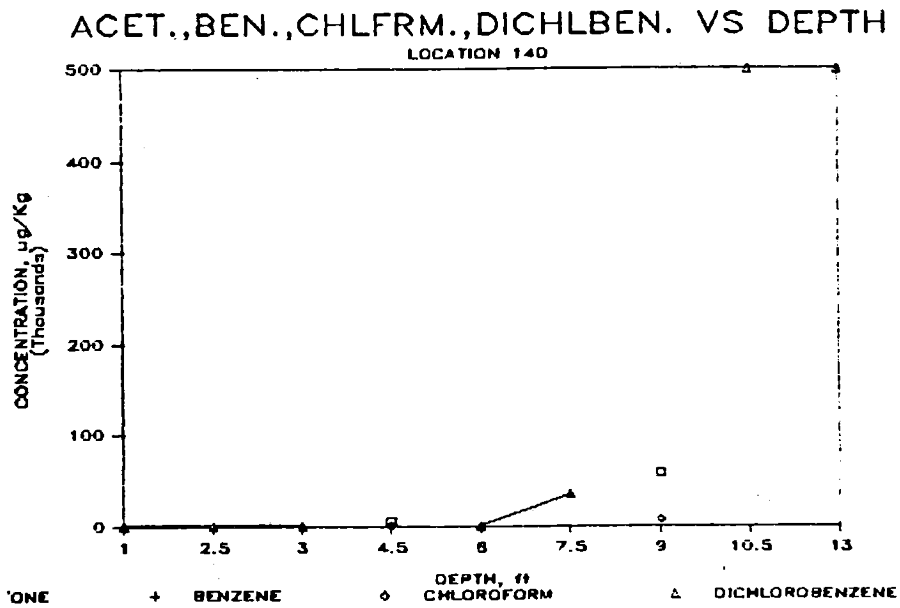
CONCENTRATION VERSUS DEPTH AT BOREHOLES 14D AND 25A

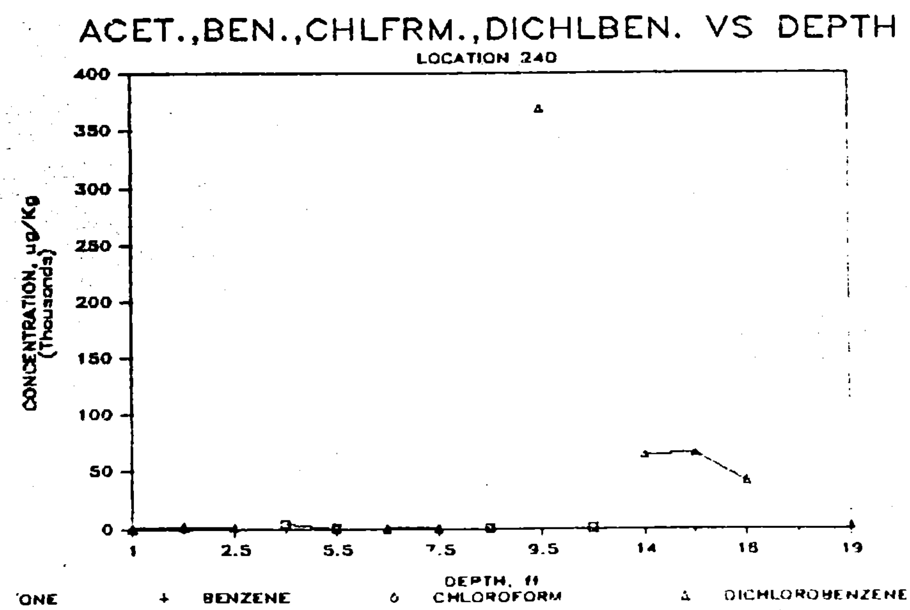




CHEMICALS OF CONCERN:

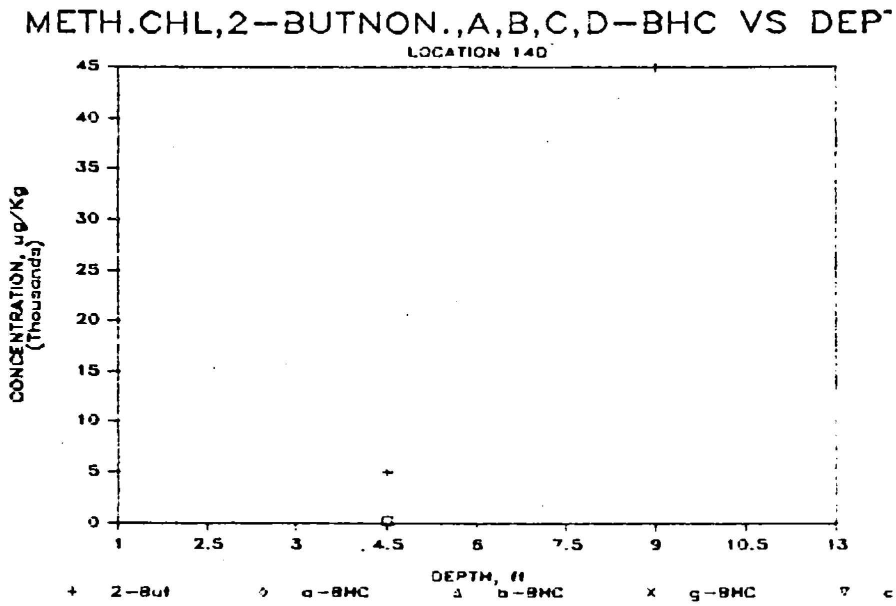
CONCENTRATION VERSUS DEPTH AT BOREHOLES 25D AND 38 D

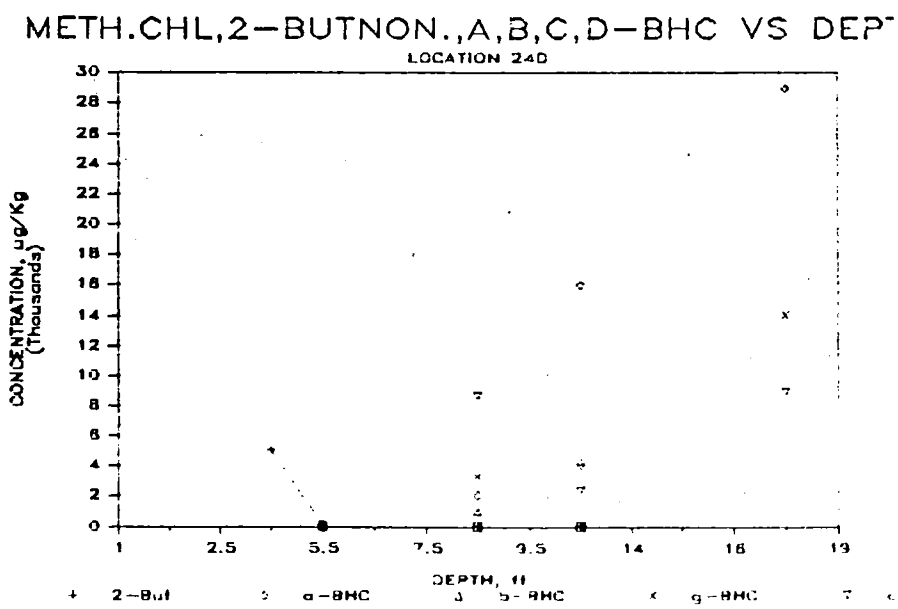




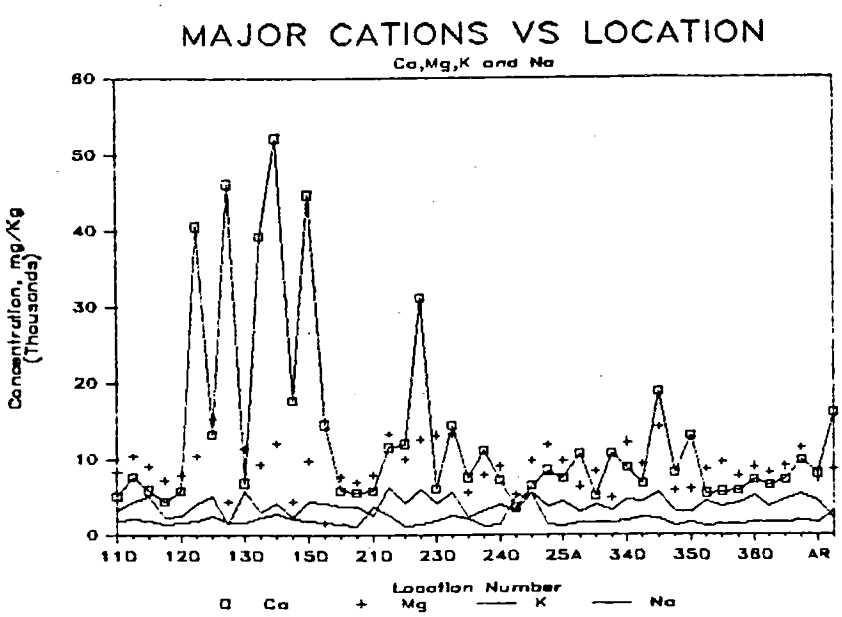
CHEMICALS OF CONCERN:

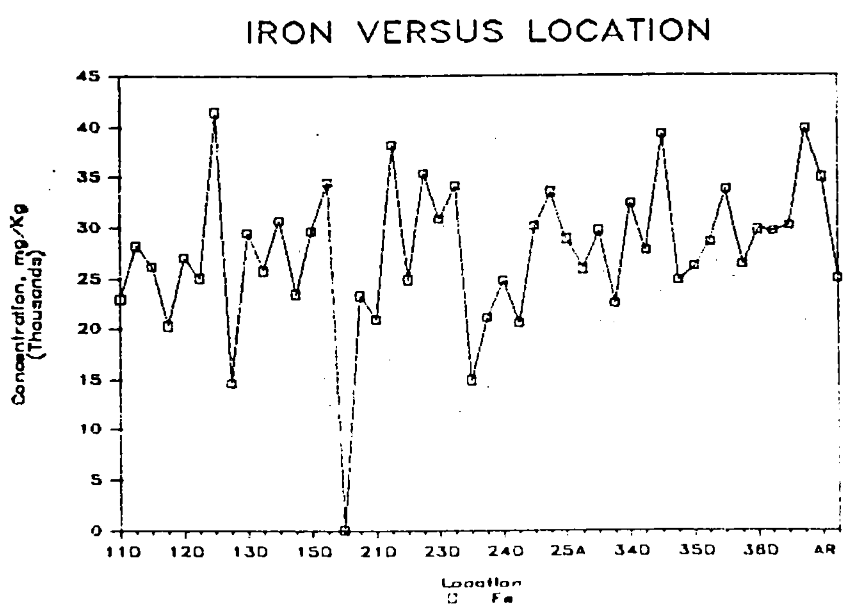
CONCENTRATION VERSUS DEPTH AT BOREHOLES 14D AND 24D





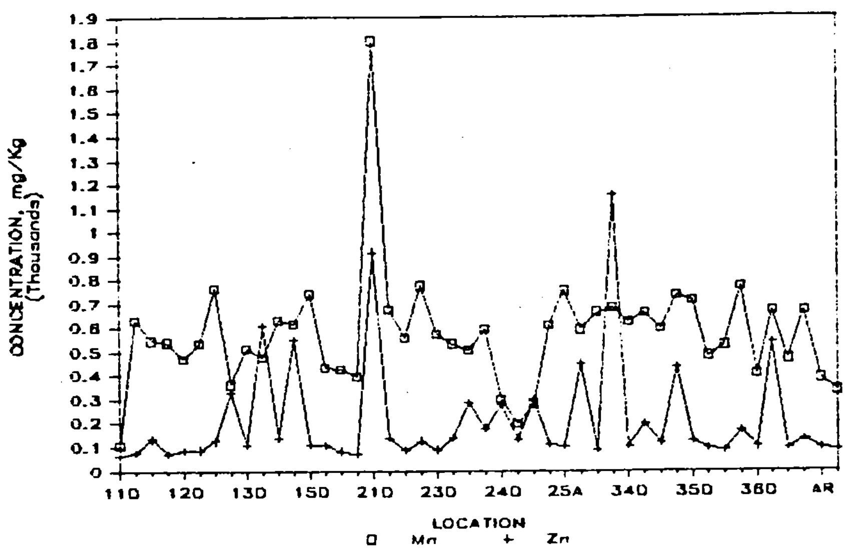
CHEMICALS OF CONCERN:
CONCENTRATION VERSUS DEPTH AT BOREHOLES 14D AND 24D



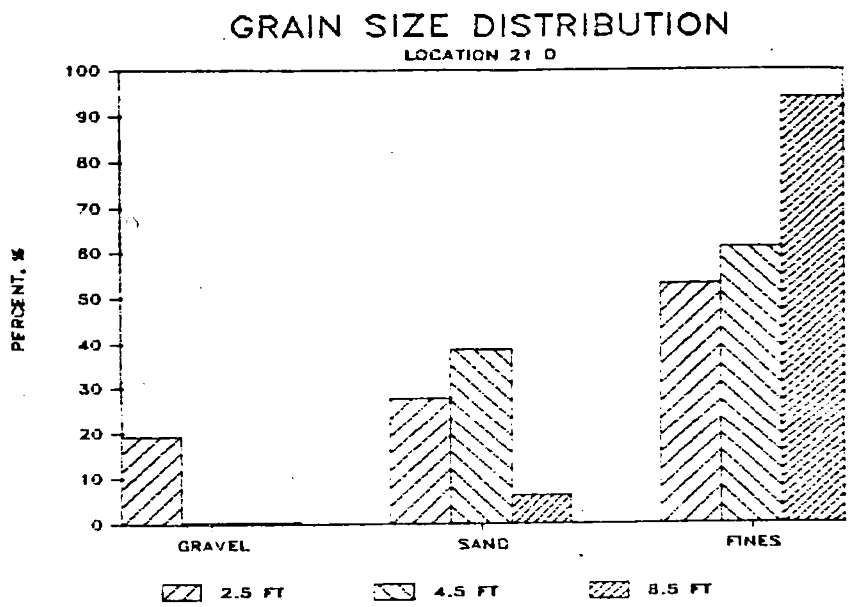


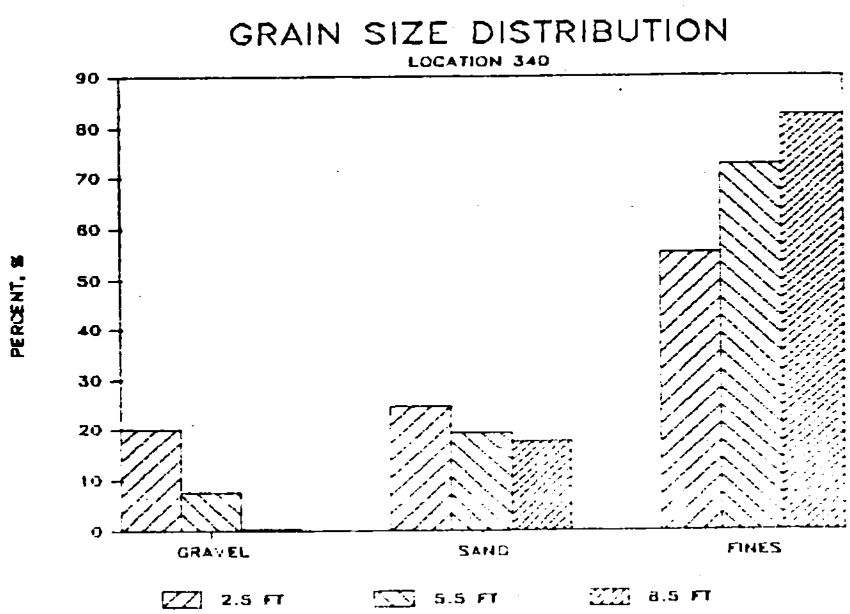
MAJOR CATION CONCENTRATIONS AT BOREHOLE LOCATIONS

MANGANESE AND ZINC VS LOCATION

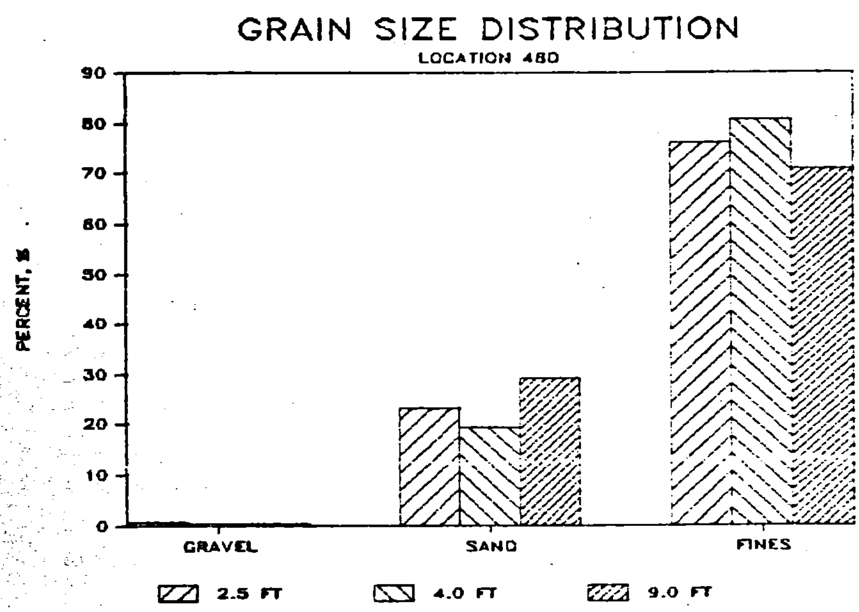


MAJOR CATION CONCENTRATIONS AT BOREHOLE LOCATIONS





GRAIN SIZE DISTRIBUTION GRAPHS



GRAIN SIZE DISTRIBUTION GRAPH

Table 5. TYPICAL PROFILE (LOS ANGELES AREA)
MONTEZUMA CLAY ADOBE

The Montezuma clay adobe consists of a dark-gray to black, in places brownish, heavy compact clay containing small quantities of gritty material of adobe structure. At a depth of 18 to 36 inches, the soil passes into a light brown to dark-brown, heavy calcareous clay loam or clay subsoil, which continues uniform to a depth of 6 ft or more. The subsoil is calcareous, the lime being distributed uniformly through the soil mass or concentrated in spots, giving a mottled appearance. In places, the content is sufficient to give the material a gray color when dry. This substratum is usually similar to the subsoil, but in some places consists of strata of differing textures. The soil is high in organic matter.

This soil type occurs on old dissected terraces, on footslopes, or on old alluvial fans and above the recent alluvial soils. Drainage is good except in nearly level areas, where water sometimes stands for short periods in wet weather. Both soil and subsoil naturally absorb water slowly, although the numerous cracks increase absorption greatly.

Source: U.S. Department of Agriculture. Soil Survey of the Los Angeles Area. 1919.

Table 6. TYPICAL SOIL PROFILE (LOS ANGELES AREA) RAMONA CLAY LOAM

The Ramona clay loam to a depth of 8 to 24 inches consists of a brown, dark-brown, or grayish-brown, light-textured clay loam. The soil is variable in texture, being lighter in the higher and more uneven areas and heavier in the more gently sloping or nearly level situations. The color also varies with the texture, being lighter where the texture is lighter and the drainage best developed, and darker where the soil is heavy and more moist. It absorbs water slowly when dry, but when once wet is permeable and quite retentive.

The subsoil is a heavy, compact clay loam or clay, of brown or reddish-brown color. It contains small concentrations of lime in places. The subsoil in some small, scattered areas also is quite firmly cemented, closely approaching a hardpan. The subsoil rests at 4 to 6 ft upon a variably textured substratum of loam or clay loam, which either continues uniform to a depth of 10 ft or more, or consists of alternating strata of sand, silt, clay, and gravel. The substratum usually is lighter colored and more permeable than the subsoil, but it is generally quite compact. It is higher in organic matter than the Ramona loam.

The type occurs mainly on old alluvial fans, footslopes, and marine terraces, and in elevated mesalike positions. The elevated position and slope give good drainage in most places, but locally there are some seepage areas. Accumulations of alkali in injurious amounts occur in such places. The dense subsoil retards the absorption of moisture, and much of the rainfall is lost in the runoff.

Source: U.S. Department of Agriculture. Soil Survey of the Los Angeles Area. 1919.

Table 7. TYPICAL PROFILE (LOS ANGELES AREA)
RAMONA LOAM

The surface soil of the Ramona loam consists of 12 to 24 inches of a brown, grayish brown, or dark brown, light-textured loam, containing small proportions of mica and gritty material. The subsoil is a reddish-brown, brown, or red, compact clay loam or clay, containing variable quantities of gritty material and mica. The subsoil may extend to 6 ft or more, but usually at about 4 ft it gives way to a brown or grayish-brown substratum of loam or clay loam, which either continues uniform to great depths or is succeeded by stratified beds of silt, sand, gravel, or clay. The subsoil is semicemented in places, closely approaching a hardpan. In such places, it absorbs water slowly especially after protracted dry periods, but when once wet, it softens considerably and retains moisture quite well. Gravel may also occur in irregular strata or lenses in the subsoil or substratum near drainageways.

It occupies old alluvial fans, footslopes, marine terraces, and elevated mesalike areas. It has a gently sloping or undulating to rolling and dissected surface. Eighty percent or more of the type has a smooth and uniform surface, except for minor drainageways, which have rounded sides and bottoms. The type generally lies at higher elevations than associated recent-alluvial soils. Its origin can be quite definitely established in the northern part of the county, where it is closely associated with the parent granitic and schistose-igneous rocks, but farther south it has undergone such marked internal changes by weathering that its identity is not so evident. The slope and the internal structure of the type favor good drainage in most places, though some of the more gently sloping land receives seepage from higher areas and contains varying amount of alkali. The rather slow absorption of water, due to the compactness of soil and subsoil, causes considerable loss by runoff during periods of heavy rainfall.

Source: U.S. Department of Agriculture. Soil Survey of the Los Angeles Area. 1919.

5674

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6

5

D

11D

1.5-2.0	1765Y-83	740,000	18,000	160,000	440
3.0-3.5	1765Y-84	80,000	2,900	1,300	340
4.0-4.5	YB091	—	—	—	—
4.5-5.0	YB090	—	—	—	—
6.0-6.5	1765Y-85	67	400	20	50
7.5-8.0	1765Y-86	140	400	20	50
9.0-9.5	YB092	16	—	—	—

12D

1.0-1.5	1765Y-[illegible]	[illegible]			
1.5-2.0	1765Y-[illegible]	[illegible]			
3.0-3.5	YB094	[illegible]			
4.0-4.5	1765Y-[illegible]	2			
4.5-5.0	176[illegible]	[illegible]			
6.0-6.5	176[illegible]	[illegible]			
7.5-8.0	1765[illegible]	[illegible]			
9.0-9.5	YB0[illegible]	[illegible]			

11D

12D

12D

1.5-2.0	1765Y-79	270,000	9,800	66,000	570
3.0-3.5	1765Y-80	310,000	4,700	[illegible]	[illegible]
4.0-4.5	YB087		—		[illegible]
4.5-5.0	YB086				[illegible]
6.0-6.5	1765Y-81	[illegible]	40	[illegible]	[illegible]
7.5-8.0	1765Y-82	40	40	[illegible]	[illegible]
8.5-9.0	YB089	—	—	—	41
9.0-9.5	YB088	—	—	—	78

MW-3

22D

1.0-1.5	1765Y-92	670,000	[illegible],200	110,000	430
1.5-2.0	1765Y-93	180,000	[illegible]	50,000	570
2.5-3.0	1765Y-97	40	40	20	50
3.0-3.5	YB095	—	—	—	—
4.5-5.0	1765Y-94	40	40	20	50
6.0-6.5	1765Y-95	40	40	20	50
7.5-8.0	1765Y-96	40	40	20	50
9.0-9.5	YB096	—	—	—	—

21D

22D

23D

C

21D

0-0.5	1765Y-87	3.2x10[illegible]	[illegible]	500,000	720
0.5-2.0	1765Y-88	530,000	17,[illegible]	97,000	1,400
[illegible]	YB0[illegible]	[illegible]			
[illegible].5-6.0	1765Y-91	[illegible]			

23D

1.0-1.5	1765Y-68	1.2×10^{6}	[illegible]
1.5-2.0	1765Y-69	1.7×10^{6}	[illegible]
[illegible]-3.6	[illegible]B08[illegible]		
4.0-4.5	1765Y-71		

5675

4

3

2

MW-4

[illegible]	[illegible],000	650,000	260J
[illegible]	[illegible],000	230,000	610J
[illegible]	26,000	290,000	1,900J
[illegible]	26,[illegible]	250,000	2,900J
[illegible]	[illegible],000	310,000	440J
[illegible]	10	790	50
[illegible]	10	[illegible]	50
[illegible]	[illegible]		40

15D

1.0-1.5	1765Y-28	$1.1x10^6$	72,000	40,000	4,[illegible]
1.5-2.0	1765Y-29	$1.4x10^6$	190,000	170,000	360,000
3.0-3.5	YB065	$2.6x10^6$	72,000	260,000	15,000
4.0-4.5	1765Y-30	150,000	10,000	9,900	1,[illegible]
7.5-8.0	1765Y-31	320	1,200	410	49[illegible]
9.0-9.5	YB066	---	---	---	[illegible]

MW-5

14D

5D

6D

14D

[illegible]	1765Y-37	$7.6x10^6$	460,000	720,000	450
[illegible]-3.0	1765Y-38	$1.2x10^6$	160,000	700,000	2,300
[illegible]	1765Y-40	$2.1x10^6$	260,000	270,000	3,000
4.5-5.0	YB069	$1.3x10^6$	67,000	170,000	6,400
[illegible]-6.5	1765Y-39	$1.6x10^6$	41,000	67,000	910,000
[illegible]	1765Y-41	660,000	58,000	51,000	540,000
9.0-9.5	YB070	$6.2x10^6$	370,000	300,000	$7.1x10^6$
10.5-11.0	1765Y-42	$11.0x10^6$	910,000	170,000	$14.0x10^6$
13.0-1[illegible]	1765Y-43	$4.4x10^6$	500,000	79,000	$9.0x10^6$

6D

[illegible]-2.0	1765Y-23	$1.1x10^6$	110,[illegible]	[illegible]
2.5-3.0	1765Y-24	47,000	1,[illegible]	[illegible]
3.0-3.5	1765Y-25	<40	<40	[illegible]
4.5-5.0	YB062			
6.0-6.5	1765Y-26	<40	<40	[illegible]
7.0-7.5	1765Y-27	<40	<40	[illegible]
8.5-9.0	YB064	---	---	---
9.0-9.5	YB063	---	---	

25A

MW-2

24D

[illegible]-2.0	1765Y-32	400,000	31,000	4,400	2,700
2.5-3.0	1765Y-33	<40	<10	<20	190
3.0-3.5	1765Y-34	<40	<10	<20	80
4.5-5.0	YB067	77			67
[illegible]-6.0	1765Y-35	<40	<10	<20	80
7.5-8.0	1765Y-36	<40	<40	<20	50
9.0-9.5	YB068	---		---	---

25D

0.5-1.0	1765Y-17	110,000	8,400	11,[illegible]	
1.5-2.0	1765Y-18	$1.7x10^6$	170,000	350,000	[illegible]
2.0-2.5	1765Y-19	$2.7x10^6$	290,000	390,000	[illegible]
4.0-4.5	YB060	880,000	34,000	65,000	[illegible]
5.5-6.0	1765Y-20	<40	<40	<20	[illegible]
7.0-7.5	1765Y-21	56,000	[illegible],400	11,[illegible]	
[illegible]	YB061				
10.5-11.0	1765Y-22	<40	<40	[illegible]	

24D

200,000	1,600
[illegible]	1,100

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2 1

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MW-5

160

Depth	Sample				
[illegible]	1765Y-23	$1.1x10^6$	110,000	$2.2x10^6$	83
[illegible]-3.0	1765Y-24	47,000	1,400	7,000	70
[illegible]	1765Y-2[illegible]	<40	<40	<20	<50
[illegible]-5.0	YB062				14
[illegible]	1765Y-26	<40	<40	<20	<50
7.[illegible]-7.[illegible]	1765Y-27	<40	<40	<20	340
[illegible]-9.0	YB064	—	—	—	15
[illegible]	YB063	—	—	—	—

Depth	Sample				
[illegible]-1.0	1765Y-17	110,000	8,400	11,000	80
[illegible]-2.0	1765Y-18	$1.7x10^6$	170,000	350,000	29,000
[illegible]	1765Y-19	$2.7x10^6$	290,000	390,000	13,000
[illegible]-4.5	YB060	880,000	34,000	65,000	14
[illegible]-6.0	176[illegible]Y-20	<40	<40	<20	1,600
[illegible]	176[illegible]-21	[illegible]6,000	[illegible],400	11,000	<50
[illegible]	[illegible]				
[illegible]	176[illegible]-22	<40	<40	<20	<50

LEGEND

MW-1 MONITORING WELL AND NUMBER

14 BOREHOLE AND NUMBER

TYPICAL SAMPLE

Depth	Sample	[illegible]T	[illegible]D ug/Kg	[illegible]DE ug/Kg	[illegible]B ug/Kg

5677

7.5-8.0	1765Y-89	400	400	20	50
9.0-9.5	YBO94				

7.5-8.0	1765Y-[illegible]
9.0-9.5	YB033

24D

1.0-1.5	1765Y-58	830,000	[illegible]	200,000	[illegible]
1.5-2.0	1765Y-59	2.0×10^{7}	100,000	550,000	[illegible]
2.5-3.0	1765Y-60	1.2×10^{6}	[illegible]	120,000	[illegible]
4.5-5.0	YB077	[illegible]	[illegible]	[illegible]	[illegible]
5.5-6.0	YB078	[illegible]	[illegible]	7,400	
6.0-6.5	1765Y-61	[illegible]	[illegible]	[illegible]	[illegible]
7.5-8.0	1765Y-62	[illegible]	[illegible]	[illegible]	[illegible]
9.0-9.5	YB079	[illegible]	[illegible]	[illegible]	[illegible]
9.5-11.0	1765Y-63	[illegible]	[illegible]	[illegible]	[illegible]
11.5-12.5	YB080	[illegible]	[illegible]	[illegible]	[illegible]
14.0-14.5	1765Y-66	[illegible]	[illegible]	[illegible]	[illegible]
15.5-16.0	1765Y-64	[illegible]	[illegible]	[illegible]	[illegible]
16.0-16.5	1765Y-65	[illegible]	[illegible]	[illegible]	[illegible]
17.5-18.0	YBO81	[illegible]	[illegible]	[illegible]	[illegible]
19.0-19.5	1765Y-67	120,000	[illegible]	[illegible]	[illegible]

8

567A

40	20	50
---	---	140

35A

1.0-1.5	1765Y-46	4,200	310	1,700	11,000
3.0-3.5	1765Y-47	210	40	30	[illegible]
4.0-4.5	1765Y-48	40	40	2	[illegible]
4.5-5.0	YB073				[illegible]
[illegible]	[illegible]	63,000	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	40	[illegible]	[illegible]	
[illegible]	[illegible]	42	[illegible]	[illegible]	
[illegible]	[illegible]				

34D

1.0-1.5	1765Y-52	980	40	440	3,200
1.5-2.0	1765Y-53	7,100	430	1,100	3,700
3.0-3.5	1765Y-54	580,000	35,000	57,000	310
4.5-5.0	YB075	630,000	17,000	94,000	830
6.0-6.5	1765Y-55	450,000	22,000	78,000	480
7.0-7.5	1765Y-56	510	40	45	290
7.5-8.0	1765Y-57	40	40	200	330
9.0-9.5	YB076	20	---	---	[illegible]

[illegible]

1.0-1.5	1765Y-11	1.6x10[illegible]	[illegible]	[illegible]	[illegible]
1.5-2.0	YB057	1.4x10[illegible]	[illegible]	[illegible]	[illegible]
2.0-2.5	1765Y-14	[illegible]	[illegible]	[illegible]	[illegible]
3.0-3.5	YB058	[illegible]	[illegible]	[illegible]	[illegible]
4.0-4.5	1765Y-13	[illegible]	[illegible]	[illegible]	[illegible]
5.5-6.0	1765Y-16	51,000	4,[illegible]	4,[illegible]	[illegible]
6.0-6.5	1765Y-15	10,[illegible]	[illegible]	[illegible]	[illegible]
9.0-9.5	YB059	[illegible]		[illegible]	

[illegible]

1.0-1.5	1765Y-1	[illegible]	
1.5-2.0	1765Y-2	[illegible]	
3.0-3.5	1765Y-3		
4.5-5.0	YB051		
6.0-6.5	1765Y-4	[illegible]	
6.5-7.0	1765Y-5	[illegible]	
10.0-10.5	YB054	[illegible]	
10.5-11.0	YB052	[illegible]	

5679

(ft)	No.	[illegible] Ki	[illegible] Ko	[illegible] K	[illegible] Y
0.5-1.0	1765-17	110,000	8,400	11,[illegible]	[illegible]

,200	310	1,700	11,000
210	40	30	<50
40	40	20	<50
			46
,000	[illegible],800	11,000	330
40	40	20	[illegible]
42	40	20	<50
			110

36D

.6x10[illegible]	140,000	320,000	1,100
.4x10[illegible]	[illegible]4,000	170,000	18
.1x10[illegible]	[illegible],000	33,000	2,100
[illegible]	[illegible],000	72,000	22,000
.1x10[illegible]	[illegible],000	62,000	1,600
[illegible]	4,000	4,600	100
[illegible]	1,[illegible]	1,100	<50
[illegible]		29	—

36D

0-2.0	1765Y-6	920	[illegible]	190	<50
3.0-3.5	1765Y-7	<40	<40	<20	<50
4.0-4.5	YB053				
4.5-5.0	1765Y-8	<40	<40	<20	<50
6.0-6.5	1765Y-9	<40	<40	<20	<50
7.5-8.0	1765Y-10	<40	<40	<20	<50
8.5-9.0	YB056	77	—	—	—
9.0-9.5	YB055	—	—	—	—

MW-1

46D

[illegible]	1765Y-1	[illegible],000	1,400	[illegible],500	<50
[illegible]-2.0	1765Y-2	100,000	15,000	33,000	120
[illegible]	1765Y-3	76	<40	22	<50
[illegible]-4.0	YB051	51		18	
[illegible]-6.[illegible]	1765Y-4	<40	<40	<20	<50
[illegible].5-7.0	1765Y-5	440	<40	75	<50
[illegible].0-10.5	YB054	430		59	
[illegible]-11.0	YB052	12	—	4	—

170
33

5680

16.0-16.5	1765Y-65	1.2x10[illegible]	88,000	[illegible]	[illegible]
17.5-18.0	YBOBI	1.9×10^{6}	67,000	[illegible]	[illegible]
19.0-19.5	1765Y-67	120,000	6,000	[illegible]	[illegible]

B

A

	DATE	MADE BY	CHECKED BY		DRAWN BY	SCALE
					DEPT. CHECK	
					PROJ. CHECK	

SCRI

BOE-C6-0178030

5681

1.0-1.5	1765Y-52	980	40	440	3,200
1.5-2.0	1765Y-53	7,100	430	1,100	3,700
3.0-3.5	1765Y-54	580,000	35,000	57,000	310
4.5-5.0	YB075	630,000	17,000	94,000	830
6.0-6.5	1765Y-55	450,000	22,000	78,000	480
7.0-7.5	1765Y-56	510	40	45	290
7.5-8.0	1765Y-57	40	40	200	330
9.0-9.5	YB076	20	—	—	32

1.0-1.5	1765Y-11	1.6x10	[illegible]	420,000	[illegible]
1.5-2.0	YB057	1.4x10	34,000	170,000	[illegible]
2.0-2.5	1765Y-14	1.1x10	[illegible]	[illegible]	[illegible]
3.0-3.5	YB058	890,000	23,000	22,000	[illegible]
4.0-4.5	1765Y-13	1.1x10	[illegible]	[illegible]	[illegible]
5.5-6.0	1765Y-16	51,000	4,000	1,600	[illegible]
6.0-6.5	1765Y-15	10,000	1,700	1,100	[illegible]
9.0-9.5	YB059	380		[illegible]	

MW-1

1.0-1.5	1765Y-1	[illegible]	[illegible]
1.5-2.0	1765Y-2	190,000	[illegible]
3.0-3.5	1765Y-3	[illegible]	[illegible]
4.5-5.0	YB051	[illegible]	[illegible]
6.0-6.5	1765Y-4	440	[illegible]
6.5-7.0	1765Y-5	440	[illegible]
10.0-10.5	YB054	430	—
10.5-11.0	YB052	12	—

SCALE: 1" = 50'-0"

METCALF & EDDY

WORK ASSIGNMENT
EPA NO. 84-299
GCA NO. 84-299-002-14

CONTRACT
EPA NO. 68-01-6769
GCA NO. 1-625-999-222-002

CHEM

REG ENG

BOE-C6-0178032

5682

160,000	320,000	1,100
34,000	170,000J	28
[illegible],000	33,000	2,100
23,000	72,000	22,000
68,000	62,000	1,600
4,000	4,600	100
[illegible]	1,100	<50
	29	——

0-2.0	1765Y-6	[illegible]	[illegible]	190	<50
3.0-3.5	1765Y-7	<40	<40	<20	<50
4.0-4.5	YB053				
4.5-5.0	1765Y-8	<40	<40	<20	<50
6.0-6.5	1765Y-9	<40	<40	<20	<50
7.5-8.0	1765Y-10	<40	<40	<20	<50
8.5-9.0	YB056	75	——	——	——
9.0-9.5	YB055	——	——	——	——

MW-1 460

[illegible]	[illegible]	[illegible]	[illegible]	<50
[illegible]	[illegible]	[illegible]	13,000	120
[illegible]		[illegible]	22	<50
[illegible]			18	
[illegible]	[illegible]	[illegible]	<20	<50
[illegible]	140	[illegible]	75	<50
[illegible]	[illegible]	——	59	——
[illegible]	12	——	4	——

OFFSITE SAMPLES

VN SURF	YB071	170	11J	30	150
VN DEEP	YB072	33	——	——	——
ART SURF	1765Y-44				8,400
ART DEEP	1765Y-45				1,900

A

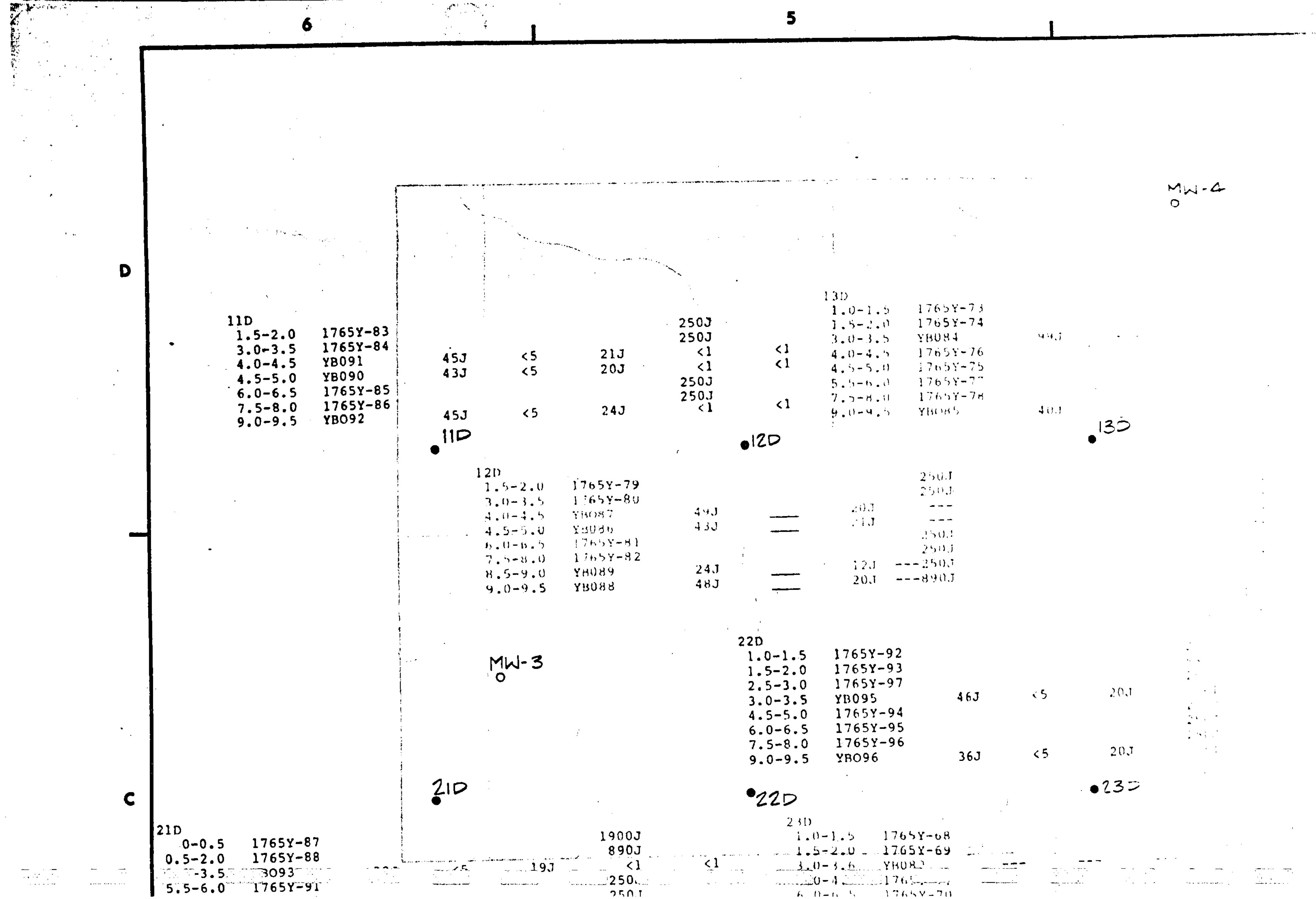
WORK ASSIGNMENT
EPA NO 84-299
GCA NO. 84-299-002-14

CONTRACT
EPA NO. 68-01-6769
GCA NO. 1-625-999-222-002

MONTROSE CHEMICAL CORP.
LOS ANGELES, CA
REMEDIAL INVESTIGATION PART 1
ONSITE SOIL SAMPLING (1985)
CHEMICALS IN SOIL: DDT, DDD, DDE & MCB

JOB
FILE NO.
SHEET

5683



BOE-C6-0178033

BOE-C6-0178034

5 6 A 4

4

3

MW-4

340J
1100J

730J
250J
250J
250J

J --- 15J

J 5J

15D

1.0-1.5	1765Y-28				<250		
1.5-2.0	1765Y-29				<250		
3.0-3.5	YB065	4,900J	<5	290	<1	<1	
4.0-4.5	1765Y-30				<250		
7.5-8.0	1765Y-31				440		
9.0-9.5	YB066	48J	<5	18	<1	<1	

MW-5

13D

14D

15D

16D

14D

1.0-1.5	1765Y-37				<250	
2.5-3.0	1765Y-38				<250	
3.0-3.5	1765Y-40				<250	
4.5-5.0	YB069	4,900J	<5	680	<1	<1
6.0-6.5	1765Y-39				<25,000	
7.5-8.0	1765Y-41				35,000	
9.0-9.5	YB070	57,000	<5	72000	<1	<1
10.5-11.0	1765Y-42				<500,000	
13.0-13.5	1765Y-43				<500,000	

16D
1.[illegible]
2.[illegible]-3.0
3.0-[illegible]
4.[illegible]-5.[illegible]
6.0-6.[illegible]
7.0-7.[illegible]
[illegible]
[illegible]

25A

MW-2

250J
530J
250J
20J <1 <1
250J
250J
250J
20J <1 <1

25A

0-2.0	1765Y-32				<250	
2.5-3.0	1765Y-33				<250	
3.0-3.5	1765Y-34				<250	
4.5-5.0	YB067	32J	<5	52	<1	<1
5.5-6.0	1765Y-35				<250	
7.5-8.0	1765Y-36				<250	
9.0-9.5	YB068	48J	<5	59	<1	1

23D

24D

25D

250J
250J

250J

25D
0.5-1.0 1765Y-17
1.5-2.0 1765Y-18
2.0-2.5 1765Y-19
4.[illegible]5 YB060 62[illegible]
5.5-6.0 1765Y-20

BOE-C6-0178035

5685

2 1

D

50
50
<1 <1
50
40
<1 <1

MW-5

16D

16D						
1.5-2.0	1765Y-23				<250	
2.5-3.0	1765Y-24				<250	
3.0-3.5	1765Y-25				<250	
4.5-5.0	YB062	43J	<5	<5	<1	<1
6.0-6.5	1765Y-26				<250	
7.0-7.5	1765Y-27				400	
8.5-9.0	YB064	49J	<5	<5	<1	<1
9.0-9.5	YB063	120J	<5	<5	<1	<1

<250
<250
<250
<5 52 <1 <1
<250
<250
<5 59 <1 <1

LEGEND

MW-1 MONITORING WELL AND NUMBER

14D BOREHOLE AND NUMBER

C

-17 <250
-18 8,900
-1 3,900
62 <1 <1
3,200

TYPICAL SAMPLE

Depth	Sample	Acetone	Benzene	Chlfrm	DIClbnzn	BHC

5686

0-0.5	1765Y-87				1900J	
0.5-2.0	1765Y-88				890J	
3.0-3.5	YBO93	30J	<5	19J	<1	<1
5.5-6.0	1765Y-91				250J	
6.0-6.5	1765Y-90				250J	
7.5-8.0	1765Y-89				250J	
9.0-9.5	YBO94	48J	<5	24J	<1	<1

23D

1.0-1.5	1765Y-68	
1.5-2.0	1765Y-69	
3.0-3.6	YB082	---
4.0-4.5	1765Y-71	
6.0-6.5	1765Y-70	
7.5-8.0	1765Y-72	
9.0-9.5	YB083	45J

24D

1.0-1.5	1765Y-58				370J	
1.5-2.0	1765Y-59				1500J	
2.5-3.0	1765Y-60				690J	
4.5-5.0	YBO77	4600J	<5	<5	<1	
5.5-6.0	YBO78	37J	<5	51J	660	40[illegible]
6.0-6.5	1765Y-61				250J	
7.5-8.0	1765Y-62				300J	
9.0-9.5	YBO79	97J	<5	21J	4660	42,000
9.5-11.0	1765Y-63				370,000J	
11.5-12.5	YBO80	63J	<5	<5	260,000	26,000
14.0-14.5	1765Y-66				65,000J	
15.5-16.0	1765Y-64				66,000J	
16.0-16.5	1765Y-65				42,000J	
17.5-18.0	YBO81	<100	<5	<5	64,000	51,000
19.0-19.5	1765Y-67				2200J	

B

BOE-C6-0178036

5687

250J	
250J	

250J	
250J	
540J	
---	8.8J

25D

0.5-1.0	1765Y-17				<250
1.5-2.0	1765Y-18				8,900
2.0-2.5	1765Y-19				3,900
4.0-4.5	YB060	62J	<5	<5	<1
5.5-6.0	1765Y-20				2,200
7.0-7.5	1765Y-21				<250
9.0-9.5	YB061	61J	<5	<5	<1
10.5-11.0	1765Y-22				<250

35A

1.0-1.5	1765Y-46				550J	
3.0-3.5	1765Y-47				250J	
4.0-4.5	1765Y-48				250J	
4.5-5.0	YB073	50J	<5	15J	<1	<1
5.5-6.0	1765Y-50				310J	
6.0-6.5	1765Y-49				250J	
7.5-8.0	1765Y-51				250J	
9.0-9.5	YB074	59J	<5	23J	<1	<1

<1
401
2,000
6,000
1,000

36D

0-2.0	1765Y-6		
3.0-3.5	1765Y-7		
4.0-4.5	YB053	37J	
4.5-5.0	1765Y-8		
6.0-6.5	1765Y-9		
7.5-8.0	1765Y-10		
8.5-9.0	YB056	50J	
9.0-9.5	YB055	72J	<5

35A

34D

35D

36D

34D

1.0-1.5	1765Y-52				250J	
1.5-2.0	1765Y-53				250J	
3.0-3.5	1765Y-54				450J	
4.5-5.0	YB075	48J	<5	5.2J	<1	27,000
6.0-6.5	1765Y-55				640J	
7.0-7.5	1765Y-56				250J	
7.5-8.0	1765Y-57				250J	
9.0-9.5	YB076	47J	5J	29J	<1	<1

35D

1.0-1.5	1765Y-11				[illegible]
1.5-2.0	YB057	32J		14	
2.0-2.5	1765Y-14				1,4[illegible]
3.0-3.5	YB058	5,900		500	
4.0-4.5	1765Y-13				[illegible]
5.5-6.0	1765Y-16				
6.0-6.5	1765Y-15				
9.0-9.5	YB059	42J	<5		

MW-1

46D

46D

1.0-1.5	1765Y-1		
1.5-2.0	1765Y-2		
3.0-3.5	1765Y-3		
4.5-5.0	YB051	31J	
6.0-6.5	1765Y-4		
6.5-7.0	1765Y-5		
10.0-10.5	YB054	35J	
10.5-11.0	YB052	43J	<5

BOE-C6-0178037

5 6 8 8

				<250		
				8,900		
				3,900		
	62J	<5	<5	<1	<1	
				2,200		
				<250		
	61J	<5	<5	<1	<1	
				<250		

TYPICAL SAMPLE

Depth (FT)	Sample No.	Acetone [illegible]	Benzene [illegible]	Chlfrm [illegible]	[illegible]	[illegible]
9.0-9.5	YB055	72J	<5	<5	<1	<1

2.0	1765Y-6				<250	
0-3.5	1765Y-7				<250	
0-4.5	YB053	37J	<5	<5	<1	<1
5-5.0	1765Y-8				<250	
0-6.5	1765Y-9				<250	
5-8.0	1765Y-10				<250	
5-9.0	YB056	50J	<5	<5	<1	<1
.0-9.5	YB055	72J	<5	<5	<1	<1

36D

Y-11				2,000	
7	32J		14	<1	15,100
Y-14				1,400	
3	5,900		500	<1	<1
Y-13				1,100	
Y-16				<250	
Y-15				<250	
9	42J	<5	8	<1	12

MW-1 46D

.0-1.5	1765Y-1				<250	
.5-2.0	1765Y-2				<250	
.0-3.5	1765Y-3				<250	
.5-5.0	YB051	31J	<5	<5	<1	90
.0-6.5	1765Y-4				<250	
.5-7.0	1765Y-5				<250	
.0-10.5	YB054	35J	<5	<5	<1	<1
.5-11.0	YB052	43J	<5	<5	<1	<1

B

BOE-C6-0178038

5689

16.0-16.5	1765Y-65				42,000J	
17.5-18.0	YBO81	<100	<5	<5	64,000	51,00
19.0-19.5	1765Y-67				2200J	

B

A

NUMBER	DATE	MADE BY	CHECKED	DESCRIPTION

REVISIONS

DRAWN BY

DEPT. CHECK

PROJ. CHECK

SCALE: 1"=50'

BOE-C6-0178039

5690

BOE-C6-0178040

51,000	1.0-1.5	[illegible]				250J	
	1.5-2.0	1765Y-53				250J	
	3.0-3.5	1765Y-54				450J	
	4.5-5.0	YB075	48J	<5	5.2J	<1	27,000
	6.0-6.5	1765Y-55				640J	
	7.0-7.5	1765Y-56				250J	
	7.5-8.0	1765Y-57				250J	
	9.0-9.5	YB076	47J	5J	29J	<1	<1

1.0-1.5	1765Y-11			
1.5-2.0	YB057	32J		14
2.0-2.5	1765Y-14			
3.0-3.5	YB058	5,900		500
4.0-4.5	1765Y-13			
5.5-6.0	1765Y-16			
6.0-6.5	1765Y-15			
9.0-9.5	YB059	42J	<5	P

MW-1 46D

46D

1.0-1.5	1765Y-1	
1.5-2.0	1765Y-2	
3.0-3.5	1765Y-3	
4.5-5.0	YB051	31J
6.0-6.5	1765Y-4	
6.5-7.0	1765Y-5	
10.0-10.5	YB054	35J
10.5-11.0	YB052	43J

SCALE: 1"=50'-0"

METCALF & EDDY

WORK ASSIGNMENT
EPA NO. 84-299
GCA NO. 84-299-002-14

CONTRACT
EPA NO. 68-01-6769
GCA NO. 1-625-999-222-002

REG. ENG

5691

·11				2,000		
	32J		14	<1	15,100	
·14				1,400		
	5,900		500	<1	<1	
·13				1,100		
·16				<250		
·15				<250		
	42J	<5	8	<1	12	

MW-1 46D

)-1.5	1765Y-1				<250	
;-2.0	1765Y-2				<250	
)-3.5	1765Y-3				<250	
;-5.0	YB051	31J	<5	<5	<1	90
)-6.5	1765Y-4				<250	
;-7.0	1765Y-5				<250	
)-10.5	YB054	35J	<5	<5	<1	<1
;-11.0	YB052	43J	<5	<5	<1	<1

OFFSITE SAMPLES

VN SURF	YB071	46J	<5	24	<1	<1
VN DEEP	YB072	49J	<5	<5	<1	<1
ART SURF	1765Y-44				<250	
ART DEEP	1765Y-45				<250	

B

A

WORK ASSIGNMENT
EPA NO. 84-299
GCA NO. 84-299-002-14

CONTRACT
EPA NO. 68-01-6769
GCA NO. 1-625-999-222-002

UNLESS OTHERWISE NOTED OR ... BY ... DUCTI...

MONTROSE CHEMICAL CORP.
LOS ANGELES,CA
REMEDIAL INVESTIGATION PART 1
ONSITE SOIL SAMPLING (JUNE 1985)
CHEMICALS IN SOIL: ACETONE, BENZENE, CHLOROFORM & DICHLOROBENZENES

JOB
FILE NO.
SHEET

BOE-C6-0178041

APPENDIX F

RESULTS OF GROUNDWATER ANALYSES

Environmental Protection Agency Results
Regional Water Quality Control Board Results
Hargis & Associates, Inc., Results

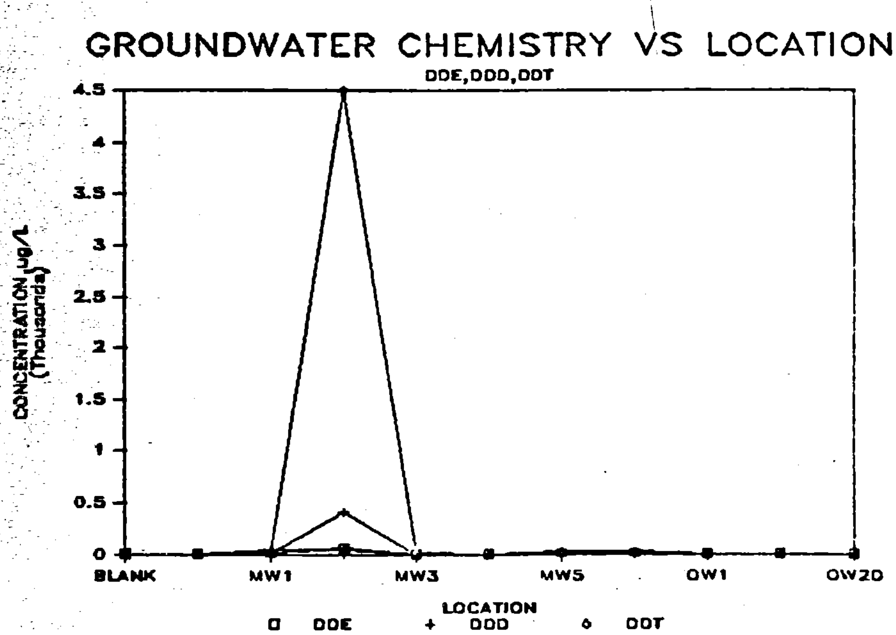


FIGURE F-1

CHEMICAL CONCENTRATIONS AT SELECTED WELLS: DDE, DDD, DDT.

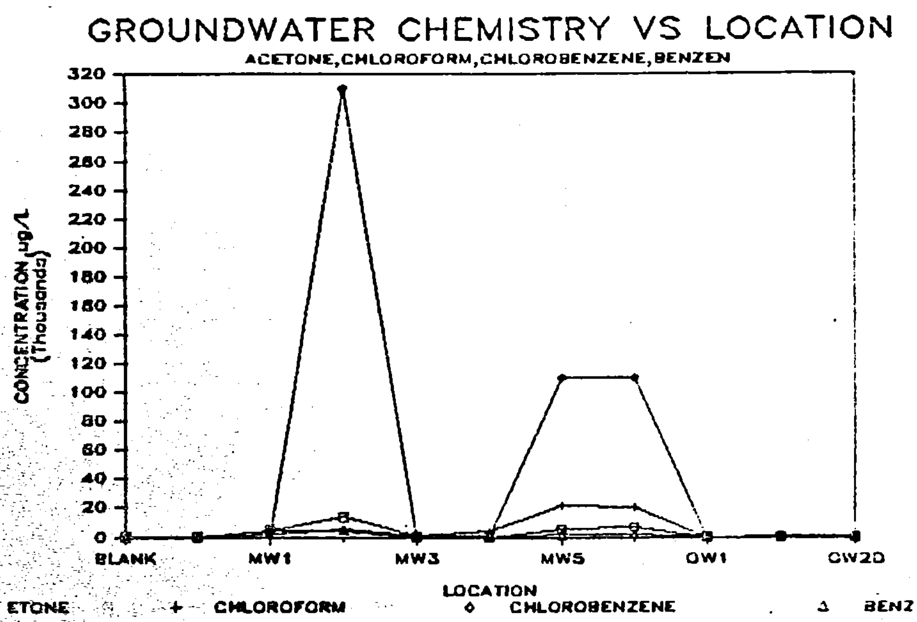


FIGURE F-2

CHEMICAL CONCENTRATIONS AT SELECTED WELLS:
ACETONE, CHLOROFORN, CHLOROBENZENE, BENZEN

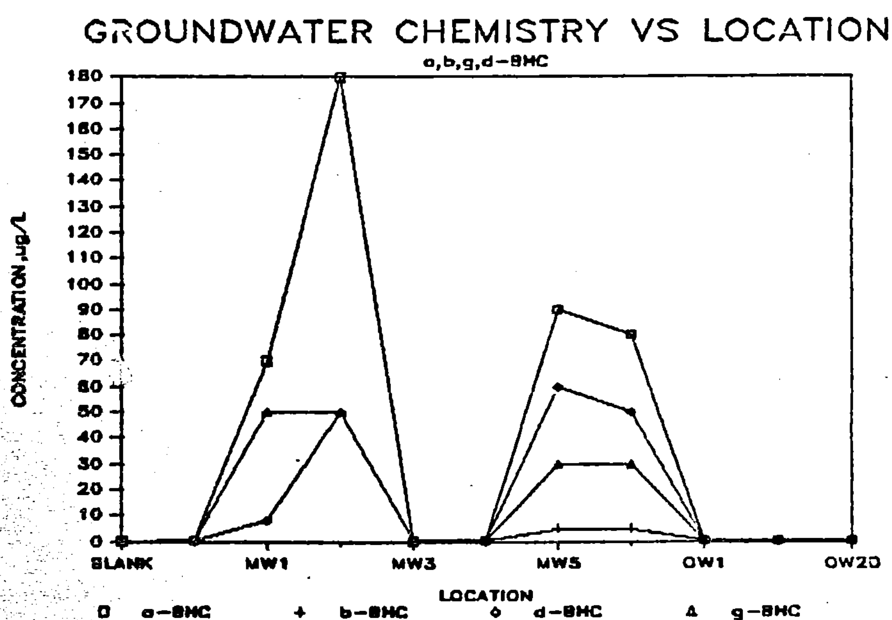


FIGURE F-3

CHEMICAL CONCENTRATIONS AT SELECTED WELLS:
a, b, g, d-BHC
F-3

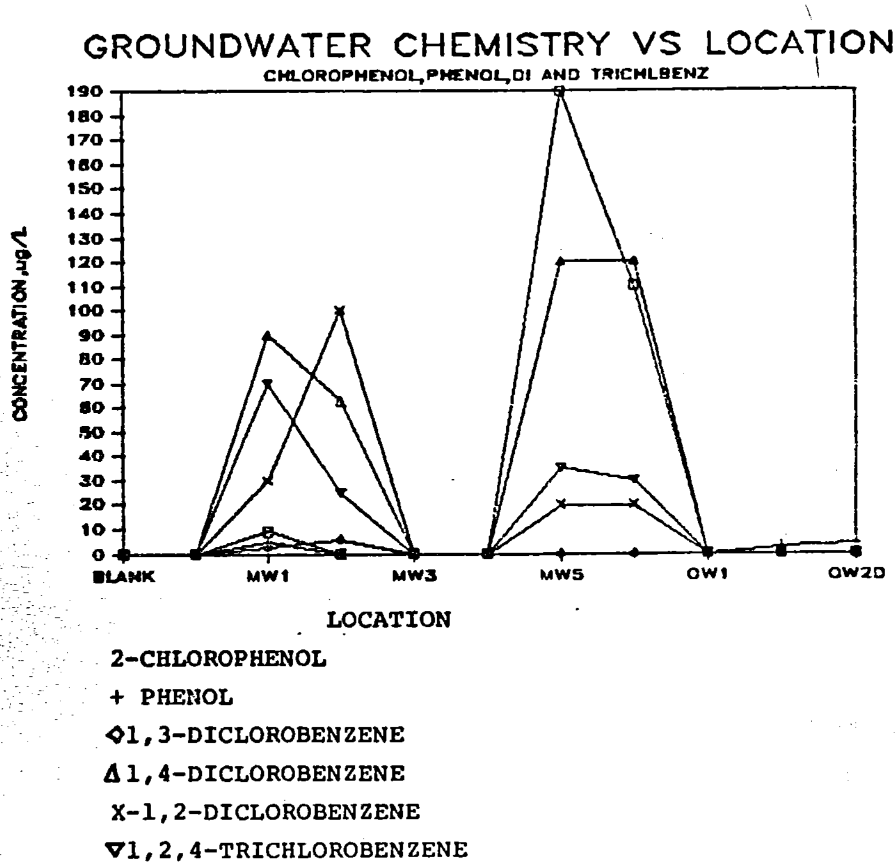


FIGURE F-4

CHEMICAL CONCENTRATIONS AT SELECTED WELLS:
CHLOROPHENOL, PHENOL, DI AND TRICHLBENZ

5697

RWQCB RESULTS

RWQCB WATER SAMPLE RESULTS[a]
ppm

Well No.	Chemical constituent[b]				
	Total DDT	MCB[c]	Benzene	PCE[d]	Chloroform
Onsite monitoring					
MW1	0.024	14	4.0	0.98	2.4
MW2	60.6	237	0.19	0.75	9.3
MW3	NA[e]	0.005	0.71	0.023	0.63
MW4	0.052	0.085	--	0.99	4.6
MW5	NA	107	1.9	0.5	20
Offsite					
OS1	ND[f]	ND	ND	ND	ND
OS2	ND	ND	ND	ND	ND

a. Regional Water Quality Control Board data for DDT from July 1985 samples and all other constitutents from August 1985 samples.
b. These five constituents are the major pollutants found consistently in all monitoring wells.
c. Monochlorobenzene, also known as chlorobenzene.
d. Percholorethylene, also known as tetrachloroethelyene.
e. Not analyzed.
f. Not detected.

HARGIS & ASSOCIATES
RESULTS

TABLE 6-1

RESULTS OF CHEMICAL ANALYSES FOR ROUTINE CONSTITUENTS IN WATER SAMPLES COLLECTED APRIL AND MAY 1985, AND JULY 1985

CONSTITUENTS (milligrams per liter)	........MONITOR WELL........ MW-1 APR - MAY	MW-1 JULY	MW-2 APR - MAY	MW-2 JULY	MW-4 APR - MAY	MW-4 JULY
Calcium	331	370	580	430	220	340
Magnesium	138	110	600	540	106	81
Sodium	455	840	2500	2500	210	220
Potassium	18	12	39	23	24	16
Carbonate	0	0	0	0	0	0
Bicarbonate	680	760	582	570	392	680
Chloride	616	670	1919	2100	680	610
Sulfate	980	900	5440	3600	165	100
Nitrate	-0.4	.71	0.9	.92	52.3	110
Fluoride	0.27	NA	6.8	5.7	0.14	.12
Boron	0.94	NA	0.97	NA	0.74	NA
Silica	38	NA	36	NA	40	NA
TDS @ 180°F	2920	3280*	13740	9480*	2010	1810*
EC @ 25°C	4400	3900	NA	14,000	3100	3200
pH (lab)	7.7	6.4	7.2	5.8	7.2	6.5
Temperature, °C						
Laboratory	B&C	B&C	B&C	B&C	B&C	B&C

TRACE METALS (milligrams per liter)	MW-1 APR - MAY	MW-1 JULY	MW-2 APR - MAY	MW-2 JULY	MW-4 APR - MAY	MW-4 JULY
Antimony	NA	NA	NA	NA	NA	NA
Arsenic	-0.01	NA	-0.01	NA	-0.01	NA
Barium	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA
Chromium (total)	NA	NA	NA	NA	NA	NA
Chromium (hexavalent)	NA	NA	NA	NA	NA	NA
Copper	-0.01	-0.09	-0.02	-0.09	-0.01	-0.09
Cyanide	NA	NA	NA	NA	NA	NA
Iron	0.08	-0.1	0.07	4.2	-0.05	-0.1
Lead	NA	NA	NA	NA	NA	NA
Manganese	1.8	1.5	35	35	-0.01	.33
Mercury	NA	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA
Strontium	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA
Zinc	0.02	-0.02	0.17	0.37	-0.01	-0.02
Laboratory	B&C	B&C	B&C	B&C	B&C	B&C

(-) = Less than NA = Not Analyzed

* Based on the sum of the ions (Hem, 1970)

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TABLE H-[illegible]

CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS, INCLUDING THE EPA VOLATILE PRIORITY POLLUTANTS, IN WATER SAMPLES COLLECTED IN APRIL AND MAY 1985, AND JULY 1985

VOLATILE ORGANIC COMPOUNDS (micrograms per liter)	MONITOR WELL MW-1 APR - MAY	MW-1 JULY	MW-2 APR - MAY	MW-2 JULY	MW-3 APR - MAY	MW-4 APR - MAY	MW-4 JULY	MW-5 APR - MAY
Acrolein	- 10	- 100	- 500	- 500	- 10	- 50	- 50	-250
Acrylonitrile	- 10	- 100	- 500	- 500	- 10	- 50	- 50	-250
Benzene	660	3200	- 50	150	40	- 5	- 5	1100
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND	ND	ND
Bromoethane	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	14	ND	- 50	- 50	16	10	25	180
Chlorobenzene	1400	15,000	54,000	180,000	59	850	160	93,000
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	1100	1600	5800	5600	760	3100	4700	24,000
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	3	ND	- 50	ND	ND	- 5	ND	ND
1,2-Dichloroethane	3	ND	150	150	ND	- 5	- 5	ND
1,1-Dichloroethylene	3	ND	100	200	ND	- 5	- 5	ND
Trans-1,2-Dichloroethylene	1	ND	- 50	ND	ND	- 5	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropylene	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	38	490	- 50	ND	ND	- 5	ND	50
Methylene chloride	63	120	- 50	400	ND	- 5	- 5	ND
Methyl ethyl ketone[1]	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	610	950	- 50	- 50	14	1100	1300	580
1,1,1-Trichloroethane	ND	ND	ND	ND	1	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	30	ND	- 50	- 50	12	- 5	5	25
Toluene	6	ND	- 50	ND	ND	- 5	ND	ND
1,1,2-Trichloro-1,2,2-Trifluoroethane (FR-113)[2]	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloro-1,2,2-Trifluoroethane[1]	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND
Acetone[2]	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylpropane[1]	400	ND	ND	ND	ND	ND	ND	ND
Cyclohexene[1]	400	ND	ND	ND	ND	ND	ND	ND
Cyclopentane[1]	600	ND	ND	ND	200	ND	ND	ND
Methylcyclopentane[1]	800	ND	ND	ND	200	ND	ND	ND
Pentane[1]	400	ND	ND	ND	300	ND	ND	1000
Xylene isomers[1]	60	140	ND	200	30	ND	ND	ND
Butane[1]	ND	ND	ND	ND	400	ND	ND	ND
Dimethylcyclopropane[1]	ND	ND	ND	ND	200	ND	ND	ND
Methylbutane[1]	ND	ND	ND	ND	400	ND	ND	ND
Laboratory	B&C	B&C	B&C	B&C	B&C	B&C	B&C	B&C

ND - None detected
(-) - Less than

[1] Non-priority pollutants, semi-quantified compounds
[2] Non-priority pollutants, quantified

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TABLE I-1

CONCENTRATION OF BASE/NEUTRAL AND ACID COMPOUNDS
IN WATER SAMPLES COLLECTED IN
APRIL AND MAY 1985, AND JULY 1985

BASE/NEUTRAL COMPOUNDS (micrograms per liter)	MONITOR WELL							
	MW-1		MW-2		MW-3	MW-4		MW-5
	APR - MAY	JULY	APR - MAY	JULY	APR - MAY	APR - MAY	JULY	APR - MAY
Acenapthene	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthyiene	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND	ND	ND	ND	ND
Benzidine	- 40	- 40	- 40	-120	- 40	- 40	- 40	- 40
Benzo (a) Anthracene	ND	ND	NS	ND	ND	ND	ND	ND
Benzo (a) Pyrene	ND	ND	ND	ND	ND	ND	ND	ND
Benzo (ghi) Perylene	ND	ND	ND	ND	ND	ND	ND	ND
Benzo (k) Fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND
3,4-Benzofluoranthene	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloroethyoxy) Methane	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloroethyl) Ether	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloroisopropyl) Ether	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Ethylhexyl) Phthalate	ND	40	ND	ND	ND	ND	ND	ND
4-Bromo Phenyl Phenyl Ether	ND	ND	ND	ND	ND	ND	ND	ND
Butyl Benzyl Phthalate	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorohaphthalene	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorophenyl Phenyl Ether	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzo (a,h) Anthracene	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	13	ND	ND	ND	ND	ND	10
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	16	38	17	67	ND	- 10	- 10	27
3,3'-Dichlorobenzidene	ND	ND	ND	ND	ND	ND	ND	ND
Diethyl Phthalate	ND	ND	ND	ND	ND	ND	ND	ND
Dimethyl Phthalate	- 25	-25	- 25	- 75	- 25	- 25	- 25	- 25
Di-N-Butyl Phthalate	- 50	-50	- 50	-150	- 50	- 50	- 50	- 50
2,4-Dinitrotoluene	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	ND	ND	ND	ND	ND	ND	ND	ND
Di-N-Octyl Phthalate	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Diphenylhydrazine	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND	ND	ND	ND	ND
Indeno (1,2,3-c,d) Pyrene	ND	ND	ND	ND	ND	ND	ND	ND
Isophorone	ND	ND	ND	ND	ND	ND	ND	ND

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TABLE I-1 (Continued)

CONCENTRATION OF BASE/NEUTRAL AND ACID COMPOUNDS
IN WATER SAMPLES COLLECTED IN
APRIL AND MAY 1985, AND JULY 1985

	MONITOR WELL							
	MW-1		MW-2		MW-3	MW-4		MW-5
BASE/NEUTRAL COMPOUNDS (micrograms per liter)	APR - MAY	JULY	APR - MAY	JULY	APR - MAY	APR - MAY	JULY	APR - MAY
Naphthalene	ND	10	ND	ND	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	-80	ND	-80	-240	- 80	- 80	- 80	- 80
N-Nitrosodi-N-Propylamine	-40	-40	-40	-120	- 40	- 40	- 40	- 40
N-Nitrosodiphenylamine	ND	-80	ND	ND	ND	ND	ND	ND
Phenanthrene	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	11	31	-10	ND	ND	-10	ND	10
ACID COMPOUNDS (micrograms per liter)								
2-Chlorophenol	31	ND	30	37	ND	- 10	- 10	71
2,4-Dichlorophenol	-10	ND	10	ND	ND	- 10	ND	ND
2,4-Dimethylphenol	ND	ND	ND	ND	ND	ND	ND	ND
4,6-Dinitro-o-cresol[2]	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitrophenol	ND	ND	ND	- 75	ND	ND	- 25	ND
4-Nitrophenol	- 25	- 25	- 25	- 75	- 25	- 25	- 25	- 25
p-Chloro-m-cresol[2]	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	17	ND	- 10	ND	ND	-10	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND
OTHER B/N-A'S (micrograms per liter)								
2-Methyl-4,6-dinitrophenol	ND	- 50	ND	-150	- 50	ND	- 50	ND
1,1'-Sulfonylbis (4-Chlorobenzene)[1]	ND	ND	ND	ND	ND	10	ND	ND
Chlorobenaldehyde[1]	ND	ND	100	600	ND	ND	10	ND
Chlorobenzoic Acid Isomers[1]	ND	ND	1000	1000	ND	ND	- 10	200
Chlorobenzamide[1]	ND	ND	400	ND	ND	ND	ND	ND
Chlorobenzyl Acetate[1]	ND	ND	100	ND	ND	ND	ND	ND
Chlorinated Aromatic[1]	ND	ND	100	200	ND	ND	ND	ND
Diphenyl Sulfone[1]	50	50	ND	ND	ND	ND	ND	ND
Diphenyl Ether[1]	30	ND	ND	ND	ND	ND	ND	ND
Hexachlorocyclohexane[1]	20	30	ND	ND	ND	ND	ND	ND
Trichloroethanol[1]	50	50	ND	ND	ND	ND	ND	100
An unidentified compound[1]	200	ND	ND	ND	ND	ND	10	ND
Butyl Carbitol[1]	ND	ND	ND	ND	200	ND	ND	90
A c6 Ether[1]	ND	ND	ND	ND	10	ND	ND	ND
Caprolactam[1]	ND	30	ND	ND	50	ND	ND	ND
Fentichlor[1]	ND	ND	ND	ND	ND	ND	ND	200
Methyl Chlorobenzoate[1]	ND	ND	ND	50	ND	ND	ND	ND
Biphenyl[1]	ND	30	ND	ND	ND	ND	ND	ND
Sulphenone[1]	ND	70	ND	ND	ND	ND	ND	ND
A Propanoate Derivative[1]	ND	30	ND	ND	ND	ND	ND	ND
Laboratory	B&C	B&C	B&C	B&C	B&C	B&C	B&C	B&C

(-) = Less than
ND = None detected

[1]Non-priority pollutants, semi-quantified compounds
[2]Non-priority pollutants, quantified

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TABLE J-1

RESULTS OF CHEMICAL ANALYSES FOR PESTICIDES AND POLYCHLORINATED BIPHENYLS IN WATER SAMPLES COLLECTED IN APRIL AND MAY, 1985

BASE/NEUTRAL COMPOUNDS (micrograms per liter)	MONITOR WELL							
	MW-1		MW-2		MW-3	MW-4		MW-5
	APR - MAY	JULY	APR - MAY	JULY	APR - MAY	APR - MAY	JULY	APR - MAY
Aldrin	- 5	4.3	- 5	- 5	- 0.5	- 5	- 5	- 0.5
alpha-BHC	200	220	- 5	- 5	- 0.5	- 5	- 5	- 0.5
beta-BHC	18	29	- 5	- 5	- 0.5	- 5	- 5	- 0.5
gamma-BHC	20	33	- 5	- 5	- 0.5	- 5	- 5	- 0.5
Delta-BHC	- 5	6.6	- 5	- 5	- 0.5	- 5	- 5	- 0.5
Chlordane	- 30	- 3	- 30	- 30	- 3	- 30	- 30	- 3
p,p'-DDD	- 5	- .5	87	360	- 0.1	- 5	- 5	- 0.1
p,p'-DDE	- 5	- .5	17	45	- 0.1	- 5	- 5	- 0.1
p,p'-DDT	- 10	17	630	2400	- 0.4	- 10	36	- 0.4
Dieldrin	- 5	- .5	- 5	- 5	- 0.5	- 5	- 5	- 0.5
alfa-Endosulfan	- 5	- .5	- 5	- 5	- 0.5	- 5	- 5	- 0.5
beta-Endosulfan	- 5	- .5	- 5	- 5	- 0.5	- 5	- 5	- 0.5
Endosulfan sulfate	- 10	- 1	- 10	- 10	- 1	- 10	- 10	- 1
Endrin	- 10	- 1	- 10	- 10	- 1	- 10	- 10	- 1
Endrin aldehyde	- 10	- 1	- 10	- 10	- 1	- 10	- 10	- 1
Heptachlor	- 5	- 1	- 5	- 5	- 0.5	- 5	- 5	- 0.5
Heptachlor epoxide	- 5	- 1	- 5	- 5	- 0.5	- 5	- 5	- 0.5
PCB 1016	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1221	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1232	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1242	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1248	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1254	ND	ND	ND	ND	ND	ND	ND	ND
PCB 1260	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	- 10	- 10	- 10	-100	ND	- 10	-100	- 10
Laboratory	B&C	B&C	B&C	B&C	B&C	B&C	B&C	B&C

(-) = Less than ND = Not detected

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BOE-C6-0178054

APPENDIX G

FIELD MEASUREMENT SUMMARIES

HNu Readings

57051

Table G-1. GROUNDWATER QUALITY SUMMARY - FIELD MEASUREMENTS

Well	Date	Time	HNu background, ppm (span potential setting)	Down well HNu reading, ppm	EC, umhos/cm	Temper-ature, deg C	pH units
MW-1	7/01/85	1030	0.7(6.92)	15	3,250	26	
		1120			3,490	25	
		1315		30	3,750	31	6.67
	7/04/85		1 (6.80)	20			
	8/13/85	0821			3,500	22.5	
		0832			3,400	22.5	
		0851			3,480	23.5	
MW-2	7/02/85	0710	0.7(7.16)	100			
		0758			10,000	24.4	5.67
		1124			13,500	26	5.77
		1140			12,500	24.5	5.87
		1200		300			
		1304		350	10,500	25.6	6.07
	7/03/85		1 (6.80)	420			
	8/13/85	1158			11,500	25	
		1208			12,000	25	
		1218			12,800	25	
MW-3	7/03/85		1 (6.80)	3			
	8/13/85	0940			1,350	22	
		0949			1,700	21.5	
		1013			1,400	22.5	
MW-4	7/02/85	1416	0.7(7.16)	40	3,500	25.9	6.72
		1510		30	3,500	26.0	6.74
	7/03/85		1 (6.80)	50			
	8/13/85	1055			2,850	23.5	
		1104			2,900	24.5	
		1114			2,850	24.0	
MW-5	7/03/85		1.9(6.80)	70			
	8/13/85	0640			3,300	21	
		0651			3,450	23	
		0727			3,400	22	
McDonnell-Douglas (OW-1)	7/08/85	0901				23.8	7.95
		0914				24.1	7.67
		0935				24.4	7.82
	8/14/85	1227			550	27	
		1241			450	26	
		1252			430	27	
LAFCD (OW-2)	7/09/85	1100	<1 (5.80)		24.8	8.8	
		1410			28.5	8.9	
	8/14/85	1036			430	25.0	

Table G-2. FIELD MEASUREMENTS: SUMMARY OF HNu READINGS

Date	Time	Location	Background HNu reading, ppm	Span potential setting[a]	HNu reading, ppm	Soil depth, ft
6/18/85	1100	46D	0.7	7.31	0.7	0.5-2
					0.7	2-3.5
					0.7	3.5-5
					1.5	6.5-8
					1.0	8-9.5
					1.0	9.5-11
	1300	36D	<1	7.31	1.0	0.5-2
					1.0	2-2.5
	1400	35D	<1	7.31	130	2-3.5
					35	3.5-5
					1.0	5-6.5
					32	6.5-6
	1550	25D	<1	7.31	<1	0.5-2
					130	3.5-5
					16	6.5-8
					50	8-9.5
6/19/85	0755	16D	0.7	3.55	3	0-0.5
					2	0.5-2
					1.5	2-3.5
					0.7	5-6.5
					1.5	6.5-8
					1.5	8-9.5
	1430	15D	0.7	3.55	300	0.5-2
					200	2-3.5
					0.7	5-6.5
					0.7	6.5-8
					0.7	8-9.5
	1530	25A	0.5	3.55	100	0.5-2
					0.5	2-3.5
					0.5	5-6.5
					0.5	8-9.5
	1630	14D	0.8	3.55	0.8	0.5-2
					400	2-3.5
					700	6.5-8
					300	8-9.5
					300	9.5-11
6/20/85		Van Ness	0.7		0.7	Profile
6/24/85		Artesia	0.7		0.7	Profile

Table G-2 (Concluded)

Date	Time	Location	Background HNu reading, ppm	Span potential setting[a]	HNu reading, ppm	Soil depth, ft
6/25/85	0830	35A	0.7	6.50	160	0.5-2
					50	3.5-5
					20	5-6.5
					8	6.5-8
					1	8-9.5
	1025	34D	0.7	6.50	0.7	0.5-2
					5	2-3.5
					18	5-6.5
					7	8-9.5
	1140	24D	0.7	6.50	10	0.5-2
					10	0-3.5
					30	3.5-5
					500	8-9.5
					400	9.5-11
					300	13-14.5
					600	15-16.5
					8	18-19.5
	1410	23D	0.6	6.50	3	0.5-2
					3	2-3.5
					3	3.5-5
					10	8-9.5
	1500	13D	0.6	6.50	0.6	0.5-2
					3	3.5-5
					8	6.5-8
					0.6	8-9.5
	1615	12D	0.7	6.50	0.7	0.5-2
					2	8-9.5
6/26/85	0700	11D	0.7	6.62	1	0.5-2
					0.7	3.5-5
					0.7	5-6.5
					0.7	6.5-8
					0.7	8-9.5
	0800	21D	0.7	6.62	0.7	0.5-2
					5	2-3.5
					2	6.5-8
					0.7	8-9.5
	0850	22D	0.7	6.62	3	0.5-2
					0.7	5-6.5
					2	8-9.5

a. For direct read benzene at 60 ppm.